

1           **METHOD AND APPARATUS FOR TARGETING VIRTUAL OBJECTS**

2           This application is a continuation-in-part of U.S. Application Serial Number  
3 09/054,419, filed April 3, 1998, entitled TARGETED ADVERTISEMENT USING  
4 TELEVISION DELIVERY SYSTEMS, which is a continuation-in-part of U.S. Application  
5 Serial Number 08/735,549, filed October 23, 1996, entitled METHOD AND APPARATUS  
6 FOR TARGETED ADVERTISING, which is a continuation of U.S. Application Serial  
7 Number 08/160,280, filed December 2, 1993, entitled NETWORK CONTROLLER FOR  
8 CABLE TELEVISION DELIVERY SYSTEM, now U.S. Patent Number 5,600,364, which  
9 was a continuation-in-part of U.S. Application Serial Number 07/991,074, filed December 9,  
10 1992, entitled REMOTE CONTROL FOR MENU DRIVEN SUBSCRIBER ACCESS TO  
11 TELEVISION PROGRAMMING.

12           **Technical Field**

13           The technical field relates to a method and apparatus for providing virtual objects that  
14 are targeted to subscribers. The method and apparatus specifically relate to monitoring,  
15 controlling and managing a content delivery network including an operations center, a local  
16 insertion center, or a subscriber's local terminal.

17           **Background**

18           Television as an advertising medium has undergone significant advances since its  
19 inception in 1939. Modern advances in digital technology now allow viewers to be very  
20 selective in choosing programs to watch. Other advances in digital technology have led to such  
21 programming enhancements as a "tail" on a hockey puck, or an overlaid first down marker on  
22 a football field. The same technological advances allow improvements in the way  
23 advertisements are currently presented. Many sporting events are now presented with virtual  
24 object advertisements included in the video. For example, the broadcast of a major league  
25 baseball game may include one or more virtual object spots in which an advertisement is  
26 displayed. The advertisements are then seen by television viewers, but not by fans who attend  
27 the game. However, the advertisements are fixed, and are not varied according to individual  
28 viewers.

1           **Summary**

2           A system and a method delivers targeted virtual objects to reception sites. A virtual  
3           object is a realistic, synthetic replica of an actual object. The virtual object is viewable within  
4           video programming and may be combined with original video and audio to supplement or  
5           replace portions of the original video and audio content. Virtual objects may be overlaid on  
6           video, partially or entirely obscuring the underlying video. An overlaid object may be static in  
7           nature, such as a graphical icon or the like, or alternatively may be dynamic, such as a video  
8           clip, animation, or scrolling alphanumeric characters, for example. Overlaid objects may be  
9           limited spatially to a fixed portion of the video screen, limited temporally to a given time for  
10          display, limited by a combination of both location and time, or tied to a spatially changing  
11          portion of the screen that is moving with time. Alternatively, virtual objects may be added to  
12          and embedded within the actual video. Multiple virtual objects may be embedded in the video  
13          in a multi-layer fashion. The virtual object is indistinguishable from the other video content  
14          sharing the field of view. Virtual objects may be interactive in nature. That is, a viewer may  
15          select an object and the selection will initiate a process whereby a reception site sends a  
16          command to a location designated by the interactive virtual object to initiate some  
17          action.

18          An operations center may process the video signal to allow for the insertion of virtual  
19          objects into the video. An object delivery center serves as a standalone or supplemental  
20          system to the operations center to deliver virtual objects independently of the video with which  
21          the virtual objects are to be associated. A delivery network includes any of a number of  
22          different delivery systems to support the delivery of video and virtual objects from the  
23          operations center and the object delivery center to a local insertion center, or directly to a  
24          reception site. The delivery network is also used to deliver video and virtual objects from the  
25          local insertion center to the reception site. The reception site receives the video and virtual  
26          objects and associates the appropriate virtual objects with the video based on targeting  
27          algorithms.

1           The reception site collects virtual object viewing information and makes the viewing  
2 information available to a local data collection center or a central data collection center using  
3 the delivery network. The local data collection center provides information collected from the  
4 reception site to the local insertion center to assist in the targeting of the virtual objects. The  
5 central data collection center provides information collected from the reception site to the  
6 operations center to assist in the targeting of virtual objects. Alternatively, the reception site  
7 may use the virtual object viewing information and other information stored at the reception site  
8 to locally target the virtual objects at the reception site. The reception site also provides  
9 interactive requests, which are driven by the selection of interactive virtual objects, to an  
10 interactive object servicing center using the delivery network. Interactive responses are  
11 returned by the interactive object servicing center to the requesting reception site.

12           A targeting routine makes use of a viewer's demographic information and viewing habits  
13 to determine those virtual objects that may be most effective when displayed to that particular  
14 viewer. In so doing, the targeting routine generates packages of virtual objects targeted to each  
15 viewer, or to groups of viewers.

16           The process of managing the content and the virtual objects to be included in the  
17 content begins with a number of configuration and set-up steps. Individual reception site  
18 address information can be collected at the operations center. This information is used to  
19 uniquely identify each reception site and to associate with that identifier necessary information  
20 to aid in the targeting process. The reception site address information may be provided to the  
21 operations center upon installation or activation of the reception site in the viewer's home.  
22 Other information may be collected from various sources, including viewer surveys and  
23 marketing databases correlated by address or zip code+4, for example.

24           Next, reception site groups are determined. This is needed if the management of  
25 information and targeting to individual reception sites is not practical initially, either due to lack  
26 of availability of information to the appropriate level of detail, or lack of technology to control  
27 and deliver virtual objects to an individual reception site. For a number of target categories,  
28 individual groups are defined. Examples of target categories include demographic targeting

1 (age/sex/income) and location, such as Area of Dominant Influence (ADI), for example. Each  
2 target category is then segmented into appropriate groups. For example, the ADI may include  
3 Los Angeles, CA and Washington D.C. New target categories can be added and the groups  
4 redefined after their initial establishment. Anywhere from one to all reception sites may be  
5 assigned to a single group.

6 For each target category, each reception site is assigned to a group based on the  
7 information collected about the reception site. Once the reception site is assigned to a group,  
8 the group assignment is conveyed to the reception site and stored therein. Alternatively, the  
9 reception site may use information collected locally to assign the reception site to  
10 groups.

11 The group assignment information that is stored at the reception site is able to survive  
12 power cycling of the reception site, and other normal service interruptions. Finally, as groups  
13 are modified or group assignments change, reception sites are notified of the changes.  
14 Additionally, the group assignment information may be periodically resent to the reception sites  
15 to ensure that newly added reception sites and those that have accidentally lost their information  
16 are up-to-date.

17 A virtual object location definer system determines where in the content the virtual  
18 objects are to be placed and the rules associated with their placement. Content may be video  
19 programming, commercials and advertisements, or electronic program guide (EPG) information,  
20 for example. A virtual object selector system determines those available virtual objects suitable  
21 for placement in a virtual object location. A targeted virtual object management system  
22 determines which reception sites or reception site groups should receive and display which  
23 virtual object for a given virtual object location. The virtual objects and targeting information  
24 are then distributed to reception sites.

25 After reception sites receive and store the virtual objects and targeting information, the  
26 reception site will place the most appropriate virtual object into virtual object locations based  
27 on the targeting information, and will display the combined content with the overlaid or  
28 embedded virtual object.

DETAILED DESCRIPTION

1           The reception site stores information indicating that a virtual object was inserted. The  
2 accumulated history information may be collected from the reception site at a later time for  
3 review purposes. The unique reception site identification information may also be provided  
4 with the collected data. As mechanisms become available to identify specific viewers in a  
5 household, the system will allow for individual identification information to also be provided with  
6 collected data. Finally, after collection of the reception site viewing history data, the reception  
7 site returns used reception site memory space to the reception site.

8           A central operations center can determine virtual object locations available for virtual  
9 object placement. Alternatively, a local insertion center can determine the virtual object  
10 locations. The operations center can determine the specific virtual objects to be placed in a  
11 virtual object location. Alternatively, the local insertion center may determine the specific virtual  
12 object to be placed in a virtual object location. The reception site itself can determine which  
13 virtual object is to be placed in a virtual object location based on its own internal  
14 routines.

15          Content, virtual objects, and associated targeting / virtual object placement control can  
16 be relayed to reception sites and information extracted from the reception site. The reception  
17 site may reside within a digital cable set top box that has access to a delivery network.  
18 Alternately, the reception site may be components of digital television satellite receivers. The  
19 reception site may be incorporated into the circuitry of a television, thereby eliminating the need  
20 for a separate control device attached to the television. Alternatively, the reception site may  
21 be incorporated into a personal computer, personal data device, smart phone with a display,  
22 or electronic book device.

23 **Description Of The Drawings**

24          The detailed description will refer to the following drawings in which like numerals refer  
25 to like items, and in which:

26           Figure 1 is an overview of the virtual object targeting delivery system;

27           Figure 2 provides a pictorial representation of virtual objects and virtual object  
28 locations;

1           Figure 3 is an example of an overlaid virtual object;  
2           Figure 4 is an example of an embedded virtual object;  
3           Figure 5 depicts an operations center;  
4           Figure 6 depicts a virtual object definer;  
5           Figure 7 is a pictorial representation of a virtual object location matte;  
6           Figure 8 depicts a virtual object selector;  
7           Figure 9 depicts a targeted virtual object management system;  
8           Figure 10 shows configuration and set-up steps associated with targeting virtual  
9       objects;  
10          Figure 11 shows a subscriber information database system;  
11          Figure 12 shows a configuration set-up system;  
12          Figure 13 shows a virtual object targeting system;  
13          Figure 14 presents an embodiment of the overall process for assigning targeted virtual  
14       objects;  
15          Figure 15 presents an embodiment of a process used by the virtual object placement  
16       engine to assign virtual objects to virtual object locations;  
17          Figure 16 presents an alternate embodiment used by the virtual object placement engine  
18       to assign virtual objects to virtual object locations;  
19          Figure 17 presents yet another embodiment used by the virtual object placement engine  
20       to assign virtual objects to virtual object locations;  
21          Figure 18 shows functions of an alternate virtual object targeting routine;  
22          Figure 19 shows an embodiment of a matrices processing subroutine that is called by  
23       the virtual objects targeting sequence;  
24          Figure 20 shows a subroutine used to select the final groupings of virtual objects to be  
25       sent to the reception sites or group of reception sites;  
26          Figure 21 shows a representation of reception site groupings;  
27          Figure 22 shows an example of a division of available bandwidth;  
28          Figure 23 shows an alternative software program flow for an object targeting routine;

1           Figure 24 depicts an object delivery center;

2           Figure 25 presents embodiments associated with the delivery of virtual objects over a  
3 coaxial or fiber cable system to a reception site;

4           Figure 26 presents embodiments associated with the delivery of virtual objects over a  
5 wireless broadcast system to a reception site;

6           Figure 27 presents embodiments associated with the delivery of virtual objects over a  
7 satellite broadcast system to a reception site;

8           Figure 28 presents embodiments associated with the delivery of virtual objects over a  
9 wired data network to a reception site;

10          Figure 29 presents embodiments associated with the delivery of virtual objects using  
11 the public switched telephony network (PSTN) to a reception site;

12          Figure 30 presents embodiments associated with the delivery of virtual objects using  
13 wireless personal communications system (PCS) to a reception site;

14          Figure 31 depicts several embodiments associated with the delivery of virtual objects  
15 using a national or local television broadcaster's signal;

16          Figure 32 depicts a local insertion center;

17          Figure 33 depicts an example of a reception site;

18          Figure 34 depicts a local data collection center;

19          Figure 35 depicts a central data collection center;

20          Figure 36 depicts an interactive object servicing center; and

21          Figure 37 presents processing performed by an interactive object servicing center.

22          **Detailed Description**

23          An overview of the virtual object delivery system is depicted in Figure 1. An  
24 operations center 10 performs the processing of a video content signal to allow for the insertion  
25 of virtual objects into the content 36. An object delivery center 15 serves as a standalone or  
26 supplemental system to the operations center 10 to deliver virtual objects independent of the  
27 content with which the virtual objects are to be associated. A delivery network 11 includes any  
28 of a number of different delivery systems to support the delivery of the content 36 and virtual

1 objects from the operations center 10 and the object delivery center 15 to a local insertion  
2 center 20 or directly to a reception site 30. A delivery network 12 is used to deliver content  
3 and virtual objects from a local insertion center 20 to the reception site 30. The reception site  
4 30 may be any device or terminal capable of receiving video, including a set top terminal, a  
5 television, a personal computer, a wireless telephone, a wired telephone, a PDA device or any  
6 similar device or terminal.

7 The reception site 30 receives the content 36 and virtual objects and associates the  
8 appropriate virtual objects with the content 36 based on targeting algorithms. The reception  
9 site 30 may collect virtual object viewing information and make the viewing information  
10 available to a local data collection center 40 or a central data collection center 50 using a  
11 delivery network 13. Alternatively, the reception site 30 may retain all virtual object viewing  
12 information and use the information to target virtual objects locally without control from the  
13 operations center 10. The local data collection center 40 provides information collected from  
14 the reception site 30 to the local insertion center 20 to assist in the targeting of virtual objects.  
15 The central data collection center 50 provides information collected from the reception site 30  
16 to the operations center 10 to assist in the targeting of virtual objects. The reception site 30  
17 provides interactive requests, which are driven by the selection of interactive virtual objects,  
18 to a interactive object servicing center 60 using a delivery network 14. Interactive responses  
19 are returned by the interactive object servicing center 60 to the requesting reception site  
20 30.

21 Virtual objects may be realistic, synthetic replicas of actual objects. Virtual objects  
22 may also be caricatures of actual individuals, photographs or other life-like renderings of actual  
23 individuals, cartoon figures, text objects, graphical renderings, or icons, for example. The virtual  
24 objects may be animated or fixed. The virtual objects are combined with video and audio to  
25 supplement or replace portions of video and audio in original content 36. As shown in Figure  
26 2, the reception site 30 may contain or be connected to a display 35 on which the content 36  
27 may be displayed. An opportunity, advertisement spot, or location, in the content 36 that is  
28 available for the placement of the virtual object will be denoted as a virtual object location 37

1 henceforward. Within the virtual object location 37, one or more individual virtual objects may  
2 be assigned, each denoted as a virtual object 38 henceforward. Multiple virtual object  
3 locations, shown as virtual object locations 37 and 39 may be present in the content 36.  
4 Multiple virtual objects, shown as virtual objects 38 and 40 may be present within the virtual  
5 object locations.

6 As shown in Figure 3, virtual objects may be overlaid on video, partially or entirely  
7 obscuring the underlying video. An overlaid virtual object may be static in nature, like a  
8 graphical icon, as shown by virtual object 42. Alternatively the overlaid virtual object may be  
9 dynamic, like a video clip, animation, or scrolling alphanumeric characters as shown by virtual  
10 object 44. Overlaid virtual objects may be limited spatially to a fixed portion of the video,  
11 limited temporally to a given time for display, or limited by a combination of both location and  
12 time. Overlaid virtual objects may also be tied to a spatially changing portion of the video that  
13 is moving with time.

14 Alternatively, as shown in Figure 4, virtual objects may be added to and embedded  
15 within video. In this alternative, the synthetic virtual object 38 could be indistinguishable from  
16 the other video content 36 sharing the field of view as shown by virtual object 46 and virtual  
17 object 48. For instance, today's technology allows for the virtual placement of a billboard at  
18 televised sports events and the placement of a virtual first down marker in televised football  
19 games.

20 In an embodiment, virtual reality and animation technologies are combined with  
21 advanced digital video techniques to provide realistic interaction of virtual objects within video.  
22 Combining these technologies, a soda can may be synthetically placed in the video, and may  
23 then be made to change over time. This placement and subsequent modification can occur at  
24 the video's source, at an intermediate point within the distribution and delivery path, or at the  
25 reception site 30. Combining the placement of virtual objects with the ability to target specific  
26 virtual objects to specific viewers or groups of viewers allows one household to see a scene  
27 with the soda can for cola, while the next door neighbor sees a root beer soda can, for  
28 example.

1           Virtual objects may be interactive in nature, where a viewer can select a virtual object  
2       35 and this selection will initiate a process whereby the reception site 30 sends a command to  
3       the location designated by the interactive virtual object 38 to initiate some action. Actions may  
4       include linking to a Web site to display content related to the interactive virtual object 38,  
5       initiating a purchase transaction, or initiating a request for more information about the selected  
6       virtual object 38.

7           The operations center 10 shown in Figure 1 may include a number of systems that act  
8       together in processing the content 36 for the inclusion of virtual objects, for the selection of  
9       appropriate virtual objects to be placed in the content 36, for the targeting of virtual objects to  
10      individual reception sites, and for the packaging and delivery of the content 36 and virtual  
11      objects to reception sites.

12          Placement of virtual objects can be explicitly selected by the operations center 10,  
13       resulting in the specific selection and placement of virtual objects into content 36. Alternatively,  
14       the placement may be generically defined by the operations center 10. In this alternative, the  
15       reception site 30 performs all the processing associated with selecting the appropriate virtual  
16       object 38 to be placed in the content 36 based on basic guidelines provided by the operations  
17       center 10 and algorithms operating at the reception site 30.

18          As shown in Figure 5, the operations center 10 includes a virtual object location definer  
19       100, a virtual object selector 200, and a targeted virtual object management system (TVOMS)  
20       300.

21          Figure 6 presents the virtual object location definer 100. A video capture processor  
22       110 processes video and audio content 36 on a frame by frame basis, converting the original  
23       content 36 into a corresponding digitized representation. The processed content 36' is then  
24       stored in content buffer 120 for future access. A pre-viewer subsystem 130 allows for the  
25       viewing of a video frame of the processed content 36'. Frame N 141, for example, (shown in  
26       Figure 7) associated with the processed content 36', may be retrieved from the content buffer  
27       120, viewed, and passed to a location selector processor 140. The location selector processor  
28       140 allows for the selection of where in the frame N 141 the virtual object 38 may be placed.

1 When the frame N 141 is retrieved by the location selector processor 140, either a static area  
2 may be selected, or alternatively, a dynamic area, which is tied to an area within the frame of  
3 the processed content 36', may be selected. An overlay matte 16 (see Figure 7) may be used  
4 in the virtual object insertion process to identify where and how a virtual object location 37 is  
5 to be placed in the processed content 36'.

6 Techniques for pattern recognition used by the location selector processor 140 to  
7 facilitate the creation of the matte 16 and the identification of the pixels within the frame that the  
8 matte 16 is to be associated with for that frame are described in detail in US Patent 5,808,695,  
9 to Rosser, Roy J.; Das, Subhodev; and Tan, Yi; entitled Method of Tracking Scene Motion  
10 for Live Video Insertion; US Patent 5,903,317, to Sharir, Avi; and Tamir, Michael; entitled  
11 Apparatus and method for Detecting, Identifying, and Incorporating Advertisements in a Video;  
12 US Patent 5,524,065, to Yagasaki, Toshiaki; entitled Method and Apparatus for Pattern  
13 Recognition; US Patent 5,627,915, to Rosser, Roy J.; Das, Subhodev; and Tan, Yi; von  
14 Kaenel, Peter; entitled Pattern Recognition System Employing Unlike Templates to Detect  
15 Objects Having Distinctive Features in a Video Field; and US Patent 4,817,171, to Stentiford,  
16 Frederick; entitled Pattern Recognition System, the disclosures of which are hereby  
17 incorporated by reference.

18 When the area is selected by the location selector processor 140 and the overlay matte  
19 16 for the initial video frame N 141 is created, a video object marker processor 160 creates  
20 the transparent overlay matte 16 that is associated with the selected area for subsequent  
21 frames, for example frame N+1 142 and frame N+2 143 of the processed content 36', for the  
22 duration of frames designated, as shown in Figure 7. This selected area defines the virtual  
23 object location 37. Pattern recognition technology may then be applied to each subsequent  
24 frame of the processed content 36' in the video object marker processor 160, creating a  
25 sequence of mattes to be applied to each frame of the processed content 36', moving and  
26 transforming as needed to match the temporal movement and transformations of the virtual  
27 object location 37 within the processed content 36' to which the virtual object 38 is to be tied.  
28 The pattern recognition technology handles transitions, cutaways, and cutbacks within the

1 processed content 36', and any visual blocking or occlusions that may occur as other objects  
2 within the processed content 36' appear in front of the dynamic area selected for virtual object  
3 location 37.

4 Simultaneously with the selection of the virtual object location 37 and the creation of  
5 the mattes, a virtual object rules processor 170 allows for the entry of rules that govern the  
6 types of virtual objects and other relevant placement guidelines associated with the virtual  
7 object location 37. These rules allow for the selection of characteristics such as the duration  
8 of the virtual object location 37, and viewing overlay characteristics such as transparency of  
9 the overlay virtual object. The operations center 10 processes the stored, non-realtime  
10 processed content 36' and the real-time (live) processed content 36'. For real-time processed  
11 content 36' the content buffer 120 serves as a short buffer, and predefined rules are pre-loaded  
12 into the virtual object rules processor 170. Additionally, the video object marker processor  
13 160 is pre-loaded with the directions as to which locations within the processed content 36' are  
14 to be treated as virtual object locations. The video object marker processor 160 then  
15 automatically searches the real-time processed content 36' using pattern recognition  
16 technologies presented above, or other technologies, and automatically creates the mattes  
17 required for each virtual object location. Once the video object marker processor 160 creates  
18 the mattes and the associated controls, the mattes are associated with the actual processed  
19 content 36' in the content buffer 120. The processed content 36', along with the mattes are  
20 then optionally processed using the optional video processor 150, which performs any  
21 necessary content encoding (e.g., MPEG4, or digitalization), and makes the content 36'  
22 available to a rules application processor 180. The rules application processor 180 creates  
23 metadata packets that carry the virtual object placement rules information and mattes and  
24 associates these packets with the processed content 36' for each virtual object location 37  
25 selected in the virtual object location definer 100.

26 Figure 8 is a block diagram of the virtual object selector 200. Processed content 36',  
27 along with the metadata packets carrying the virtual object placement rules information  
28 associated with each virtual object location 37 and the mattes 16 are provided by the virtual

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1 object location definer 100 to the virtual object selector 200. An object selector processor  
2 210 extracts the placement rules and stores the processed content 36' in a content buffer 240.  
3 Using the placement rules, along with any operator entered object placement guidance, the  
4 object selector processor 210 queries an object matcher processor 230 to initiate the selection  
5 of virtual objects that match the requisite rules. The object matcher processor 230 can be  
6 commanded by the object selector processor 210 to match a virtual object 38 in at least three  
7 manners: 1) automatically, 2) with manual placement, and 3) with pre-selected virtual objects.  
8 For automatic matching, the object matcher processor 230 searches an available virtual objects  
9 database 220 to find virtual objects that meet the placement rules provided by the object  
10 selector processor 210. The matching virtual objects are then marked in the available virtual  
11 objects database 220 as suitable for that virtual object location 37. For manual matching, the  
12 operator of the object matcher processor 230 manually selects the desired virtual objects to  
13 be associated with a virtual object location 37, and marks the selected virtual objects as  
14 suitable for the virtual object location 37 in the available virtual objects database 220. For  
15 pre-selected objects, the placement rules will indicate the pre-defined virtual objects to be  
16 associated with the processed content 36'. The object matcher processor 230 marks the  
17 pre-determined virtual objects in the available virtual objects database 220 as being associated  
18 the particular processed content 36' and virtual object location 37.

19 Virtual objects may be processed and stored in the available virtual objects database  
20 220 before they are used. Processing of the virtual objects includes digitizing the virtual object  
21 38 and associating the virtual object with those virtual object 38 placement guidelines and rules  
22 that must be followed to place the virtual object 38 within virtual object locations. The rules  
23 and guidelines may include product categories with which the virtual object 38 should be  
24 associated, or in contrast, cannot be associated with, the type of virtual object 38, the duration  
25 that the virtual object 38 is valid to be used, and the number of times the virtual object 38 may  
26 be used.

27 In a non-realtime environment, an optional post viewer processor 260, which is  
28 preceded by a virtual object insertion processor 250, is used to view the content 36 and insert

1 each virtual object 38 that was matched to the content 36 by the object matcher processor 230  
2 in the corresponding virtual object location 37. Techniques for insertion of overlaid virtual  
3 objects are described in detail in U.S. Patents 4,319,266 to Bannister, Richard S.; entitled  
4 Chroma Keying System; 4,999,709 to Yamazaki, Hiroshi; and Okazaki, Sakae; entitled  
5 Apparatus for Inserting Title Pictures; 5,249,039, to Chaplin, Daniel J.; entitled Chroma Key  
6 Method and Apparatus; and 5,233,423 to Jernigan, Forest E.; and Bingham, Joseph; entitled  
7 Embedded Commercials within a Television Receiver using an Integrated Electronic Billboard,  
8 the disclosures of which are hereby incorporated by reference.

9 Techniques for the insertion of embedded virtual objects are described in detail in U.S.  
10 Patents 5,953,076, to Astle, Brian; and Das, Subhodev; titled System and Method of Real  
11 Time Insertions into Video Using Adaptive Occlusion with a Synthetic Reference Image;  
12 5,892,554, to DiCicco, Darrell; and Fant, Karl; entitled System and Method for Inserting  
13 Static and Dynamic Images into a Live Video Broadcast; 5,515,485, to Luquet, Andre; and  
14 Rebuffet, Michel; entitled Method and Device for Modifying a Zone in Successive Images;  
15 5,903,317, to Sharir, Avi; and Tamir, Michael; entitled Apparatus and Method for Detecting,  
16 Identifying and Incorporation Advertisements in a Video; and the MPEG4 standard, the  
17 disclosure of which are hereby incorporated by reference.

18 In a realtime environment, the optional post viewer processor 260 is bypassed, and the  
19 default virtual object 38 is placed in the virtual object location 37 by a default virtual object  
20 insertion processor 270, which includes (not shown) a virtual object insertion processor 250.

21 The targeted virtual object management system (TVOMS) 300 shown in Figure 9  
22 allows for virtual objects, including virtual object-based advertisements, to be directed to  
23 subscribers based on, for example, the use of subscriber data, programs watched data, past  
24 virtual objects viewing data, and/or mood indicators entered by the subscriber. Alternatively,  
25 input from subscribers collected through form-based questionnaires (hard copy, electronic, and  
26 telephone, for example) may be used to further define a subscriber's potential likes, wants, and  
27 needs. Advertisers wanting to optimize their advertising expenditures may direct virtual objects  
28 to the appropriate viewing audiences to ensure that specific virtual objects are viewed by the

1 desired audience. Specifically, advertisers can display specific virtual objects in content 36 that  
2 is being viewed by those subscribers most likely to be influenced to buy the advertised product,  
3 or otherwise respond in a desired fashion to the virtual objects.

4 Virtual objects may also be targeted to reception sites on various levels. At a highest  
5 level, virtual objects can be delivered to all reception sites viewing content 36, with no targeting  
6 of the virtual objects to the subscriber, but with the virtual objects displayed in the content 36  
7 that are determined to be most relevant to the content 36. That is, the virtual objects are  
8 placed in the virtual object location 37 without the use of an individual or group targeting  
9 algorithm. Alternatively, some level of targeting may occur based on, for example, ADI, zip  
10 code +4, geographical data and other similar criteria. In this alternative embodiment, the virtual  
11 objects are sent to a terminal, and a local insertion routine in the terminal controls placement  
12 of the virtual objects into the virtual object locations 37 in the content 36. The virtual objects  
13 may be stored in the terminal and may be periodically refreshed. To account for terminals that  
14 do not have virtual objects available for insertion, the content 36 may be provided with a  
15 default virtual object embedded in the content 36. Upon receipt of the content at a terminal,  
16 the terminal, using the local insertion routine, determines if the default virtual object should be  
17 replaced with another virtual object residing in the terminal's memory.

18 Alternatively, virtual objects may be targeted to groups of reception sites, with the  
19 groups of reception sites categorized based on some other common subscriber characteristics  
20 such as programs watched data, for example. Finally, virtual objects may also be targeted to  
21 specific subscribers that share the use of a reception site 30 based on their unique subscriber  
22 characteristics.

23 To target virtual objects, the TVOMS 300 may make use of information from  
24 numerous sources. These sources include collected programs watched data that are stored in  
25 the reception site 30, and periodically uploaded to the central data collection center 50 or the  
26 local data collection center 40, and from past virtual objects viewed information that is stored  
27 in the reception site 30 and periodically uploaded to the data collection centers. Additionally,  
28 these sources may include information from marketing databases and past television programs

1 watched data, as described in U.S. Patent No. 5,798,785, entitled TERMINAL FOR  
2 SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY  
3 SYSTEM, filed December 2, 1993, incorporated herein by reference.

4 The TVOMS 300 supports the management of information required to support each  
5 of the following: (1) delivery of targeted virtual objects along with content 36 being broadcast;  
6 (2) delivery of targeted virtual objects to subscribers independent of any content 36 being  
7 broadcast; and (3) delivery of TVOMS-related subscriber-specific information and commands.

8 Figure 9 shows the TVOMS 300 supporting the targeting of virtual objects to  
9 subscribers. Broadcast information can be destined for the entire population of subscribers  
10 receiving the content 36, groups of subscribers, and individual subscribers. Broadcast  
11 information can include actual content 36, metadata packets with virtual object insertion control  
12 information, virtual objects for placement within the content 36, and command information  
13 required by the subscriber's reception site 30 to configure the reception site 30 and place the  
14 appropriate virtual object 38 within the content 36. Broadcasting may be supported over a  
15 variety of broadcast-capable communication systems, such as the Internet, cable television  
16 systems, terrestrial broadcast systems, satellite broadcast systems, and wireless  
17 communications systems, and other systems described below.

18 A subscriber information database 1210 contains subscriber information collected from  
19 numerous sources for each subscriber or reception site 30. The subscriber information may  
20 then be used by a virtual object targeting system 1220 to determine the best virtual objects to  
21 be distributed for inclusion in the content 36. Additionally, the information collected may be  
22 used to determine if the subscriber information has changed to the point that refreshed virtual  
23 objects should be delivered to a subscriber or, alternatively, whether a subscriber's group  
24 assignments should be updated. The virtual object targeting system 1220 determines the  
25 optimum subset of virtual objects to be associated with the content 36 based on the selected  
26 object metadata provided by the virtual object selector 200 (Figure 5) and subscriber  
27 information from the subscriber information database 1210. A content and virtual object  
28 packager 1260 is directed to retrieve the appropriate virtual objects from an available virtual

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1 objects database. The content and virtual object package 1260 then, along with the content  
2 36, from a content buffer 1270, addresses the virtual objects with the appropriate group  
3 addressing information, and packages the virtual objects with the content 36. A delivery  
4 packager 1300 then delivers the combined package of virtual objects, content 36, and  
5 metadata to subscribers.

6 As an alternative to delivering virtual objects with associated content 36, virtual objects  
7 can be delivered independently to individual subscribers or groups of subscribers based on  
8 updated subscriber information, modified group assignments, or the need for refreshed virtual  
9 objects at the reception site 30. Initiation could be automatic based on a scheduled cycle or  
10 by TVOMS operator direction. Upon delivery initiation, the virtual object targeting system  
11 1220 uses subscriber information from the subscriber information database 1210, information  
12 about available virtual objects from the available virtual objects database 1265, and information  
13 about previously delivered virtual objects from the subscriber information database 1210, to  
14 select the appropriate virtual objects to be packaged and delivered to a reception site 30.  
15 Once the virtual object targeting system 1220 determines the appropriate virtual objects, the  
16 content and virtual object packager 1260 retrieves the appropriate virtual objects, packages  
17 the virtual objects with reception site configuration information, addresses the information either  
18 to a single subscriber or group of subscribers, and delivers the information to the appropriate  
19 reception site 30 using a delivery processor 1300. This delivery can be done in broadcast  
20 fashion or by communicating to reception sites directly. Virtual objects may alternately be  
21 broadcast to all reception sites, and a reception site 30 may store only the virtual objects that  
22 are associated with groups to which the reception site 30 belongs. Alternatively content 36,  
23 virtual objects, and other information destined to reception sites may be provided to the object  
24 delivery center 15 (Figure 1) for delivery.

25 The databases addressed in Figure 9 may be configured to support a variety of  
26 information necessary for the TVOMS 300 to manage the targeting process. Below are tables  
27 that present typical data that may be tracked by these individual databases.

1                   Subscriber Information Database 1210

2                   Reception system identification information

3                   Reception site type

4                   Date of system set-up

5                   Date of last communication with operations center

6                   Household income

7                   User data (for each registered subscriber), including:

8                   Name

9                   Sex

10                  Age

11                  Place of birth

12                  Education

13                  Profession

14                  TV program preferences

15                  Demographic information

16                  Past advertising viewed data, which virtual objects, time spent viewing,

17                  Past products ordered, along with time, date, and method of order

18                  Past billing information

19                  Imputed subscriber data from marketing databases

20                  Past TV programs watched data, along with time and date

21                  Past PPV programs ordered data, along with time and date

22                  Mood indicators

23                  Form based questionnaire results

24                  Communication methods available (available options for both return and  
25                    delivery)

26                  Group assignments per subscriber for each category

27                  Past virtual objects delivered to subscriber, date of delivery, method of  
28                    delivery

1 Zip+4 information

2                   Available Virtual Objects Database 1265

3                   Virtual object identifier with actual digital version of virtual (CR) object Display  
4                   options (e.g., text, audio, graphics, video, link, HTML, XML, interactive)

5                   Static vs. dynamic virtual object indicator,

6                   If a linked virtual object, link table information

7                   Pricing subsidy information

8                   Run through completion status mode indication

9                   Date of valid use

10                  Virtual object placement controls, acceptable frequency

11                  Category and group preferences (as virtual object ranking percentages)

12                  Pending Commands Database 1215

13                  For each pending command:

14                   Destination address

15                   Actual command

16                   Date generated

17                   Date of confirmed receipt

18                  Within the TVOMS 300, the virtual object targeting system 1220 is responsible for the  
19                  intelligent and rapid selection of virtual objects for placement in content 36. Category and  
20                  group targeting is managed in a manner similar to that described in co-pending U.S. Application  
21                  Serial No. 09/054,419 entitled TARGETED ADVERTISEMENT USING TELEVISION  
22                  DELIVERY SYSTEM, filed April 3, 1998, and in co-pending U.S. Application Serial No.  
23                  09/328,672 entitled ELECTRONIC BOOK SELECTION AND DELIVERY SYSTEM  
24                  WITH TARGETED ADVERTISING, filed on June 9, 1999, both of which are incorporated  
25                  herein by reference.

26                  Careful management of the virtual objects within the content 36, based on information  
27                  known about the demographics and viewing habits of subscribers, for example, can greatly  
28                  increase both the advertisers' likelihood of reaching an interested subscriber, and the likelihood

1 a subscriber will be interested in a specific virtual object 38. Each virtual object location 37  
2 within the content 36 is assigned a series of virtual objects by the TVOMS 300, and when  
3 multiple virtual objects are delivered for a given virtual object location 37 in the content 36, a  
4 retrieval plan is developed that directs which virtual objects should be displayed for a given  
5 subscriber or reception site 30, a group of subscribers or reception sites, or the entire  
6 subscriber population.

7 The process of managing the targeted virtual objects begins with a number of  
8 configuration and set-up steps shown in Figure 10 that begins with the start step shown in  
9 block 7010 and ends with the end step shown in block 7017. First, individual reception site  
10 address information is collected by a subscriber data collection engine 1202 in the address  
11 information collection block 7011. This address information uniquely identifies each reception  
12 site 30 subscriber and associates necessary address information about each subscriber with the  
13 reception site identifier to aid in the virtual objects targeting process. This address information  
14 includes subscriber profile information, programs viewed information, past virtual objects  
15 delivered and viewed, and responses to menu-based questionnaires or other questionnaires  
16 completed by the subscriber. In block 7012, other subscriber information may be collected  
17 from various sources, including surveys and marketing databases correlated by address or zip  
18 code+4, for example.

19 Next, a number of target categories are defined as shown in block 7013. Examples  
20 of target categories include demographic targeting (age/sex/income) and location, such as Area  
21 of Dominant Influence (ADI). Next, as shown in block 7014, each target category is then  
22 segmented into appropriate groups. For example, the ADI may include Los Angeles, CA and  
23 Washington D.C. New target categories can be added and the groups redefined after their  
24 initial establishment.

25 Next, as shown in block 7015, for each target category, each reception site 30 is  
26 assigned to a group based on the information collected about the subscriber. Once each  
27 subscriber is assigned to a group, the group assignments are conveyed to the reception site 30  
28 and stored therein, as shown in block 7016. As groups are modified or group assignments

1 change, the reception sites are provided with the changes. Additionally, the group assignment  
2 information is periodically resent to the reception sites to ensure that newly added reception  
3 sites and those reception sites that have accidentally lost their information are up-to-date.  
4 Alternatively, the reception site 30 may perform the processing of information about the  
5 characteristics of the subscriber, and generation of the group assignment information internal  
6 to the reception site.

7 Returning to Figure 9, the virtual object targeting system 1220 determines the optimum  
8 types of virtual objects to be placed in the content 36 from the selected virtual objects provided  
9 by the virtual object selector 200 (Figure 5). The virtual object targeting system 1220 takes  
10 into account subscribers who will likely view the content 36, the desirability of providing  
11 available virtual objects to those subscribers, target categories, the number of virtual objects  
12 locations available for the content 36, and the number of virtual objects available for assignment  
13 for a given virtual object location 37.

14 Once specific virtual objects are selected for one or more available virtual object  
15 locations 37, the groups that should view each virtual object 38 are determined, based on the  
16 target category of interest. The selected virtual object locations 37 may include all virtual  
17 object locations, or a subset of all the virtual object locations. Assignment of a reception site  
18 30 to a group for the appropriate virtual objects may be based on a detailed retrieval plan. The  
19 retrieval plan may provide information for one virtual object location 37 or multiple virtual  
20 object locations within content 36, where one or more virtual objects, target categories, and  
21 the groups to which each virtual object 38 is targeted within each virtual object location 37 is  
22 also provided. An example retrieval plan is provided in Table C below. Alternatively, the  
23 retrieval plan providing virtual object assignments to virtual object locations may be sent  
24 independently from the retrieval plan providing virtual objects, target categories, and the groups  
25 to which each virtual object 38 may be targeted. Retrieval plans may be distributed along with  
26 the virtual objects and the associated content 36 directly to the reception sites by the delivery  
27 processor 1300 or using the object delivery center 15. Alternatively, a retrieval plan may be

1 distributed by the delivery processor 1300 or using the object delivery center 15 independent  
2 of the associated content 36 or virtual objects.

3 After the reception site 30 receives and stores the virtual objects and the retrieval plan,  
4 the reception site 30 inserts those virtual objects into the appropriate virtual object locations  
5 in the content 36 based on the retrieval plan. The reception site 30 may retrieve and store only  
6 those virtual objects associated with that reception site's group assignment for that virtual object  
7 location 37. Alternatively, the reception site 30 may retrieve and store all virtual objects but  
8 only insert those virtual objects into virtual object locations as dictated by the retrieval  
9 plan.

10 When the virtual objects are displayed within the content 36, the reception site 30 will  
11 store virtual objects viewed data indicating that a virtual object 38 was shown. In an  
12 embodiment, the reception site 30 will store this virtual object viewed data only if the virtual  
13 objects are displayed for a predetermined time, or only if the subscriber takes an action to  
14 indicate the virtual object 38 has been viewed, such as by selecting an interactive virtual object  
15 38, for example. Accumulated virtual objects viewed data may be collected from a reception  
16 site 30 at a later time for review purposes. Unique reception site identification information also  
17 may be provided with the collected virtual objects viewed data. Upon collection of the virtual  
18 objects viewed data, the reception site 30 may return the used memory space to available  
19 pools for future use.

20 The virtual object targeting system 1220 receives requests from the metadata extractor  
21 processor 1200 to initiate the determination of virtual objects to be placed. The metadata  
22 extractor processor 1200 receives content 36 and associated virtual object information from  
23 the virtual object selector 200 (Figure 5). The virtual object targeting system 1220 provides  
24 outputs to the content and virtual object packager 1260 and the retrieval plan generator 1275.

25 A part of the TVOMS 300 operation is the retrieval of subscriber data, and the  
26 assimilation of the subscriber data into the virtual objects selection method. This operation  
27 typically includes two steps. First, subscriber data is retrieved from the reception sites by the  
28 central data collection center 50 or the local data collection center 40 (Figure 1). The

1 subscriber data is compiled and sent to the data collection engine 1202 in the operations center  
2 10. Once assembled at the TVOMS 300, the data is filtered for each application of the  
3 TVOMS 300. In an embodiment, the subscriber information database 1210 receives inputs  
4 from the subscriber data collection engine 1202 and a configuration set-up system 1205. The  
5 subscriber information database 1210 provides outputs to the configuration set-up system  
6 1205, and the virtual object targeting system 1220.

7 The data gathered includes:

8 What products a subscriber purchased and when they were purchased,  
9 What Pay Per View (PPV) TV programs a subscriber purchased and when  
10 they were purchased,  
11 What television programming a subscriber has viewed,  
12 What virtual objects a subscriber viewed and for how long, and  
13 Subscriber profile information.

14 Subscriber profile information may be collected and stored for one or more subscribers  
15 for the purposes of virtual objects targeting. The subscriber profile may include demographic  
16 information that may be gathered in a number of ways. The reception site 30 builds the  
17 subscriber profile for each subscriber and stores the information in a memory file by subscriber  
18 name. The file may be uploaded to the central data collection center 50 or the local data  
19 collection center 40 and provided to subscriber data collection engine 1202 periodically.  
20 Subscriber preference information may be collected using on screen menus at the reception  
21 site 30, including information such as name, sex, age, place of birth, place of lower school  
22 education, employment type, level of education, amount of television program viewing per  
23 week, and the number of television shows in particular categories that the subscriber watches  
24 in a given week such as, sports, movies, documentaries, sitcoms, amount of Internet use and  
25 favorite web sites, etc. Any demographic information that will assist the TVOMS 300 in  
26 targeting virtual objects may be used.

27 In addition to demographic information gathered at the reception site 30, the subscriber  
28 profile can be compiled using other methods. For instance, subscriber information can be

1 gathered using questionnaires sent by mail and subsequently entered in the subscriber  
2 information database 1210.

3 As an alternative to gathering demographic data, a simulated subscriber profile can be  
4 generated using an algorithm that analyzes subscriber access history and subscriber habits.  
5 Using test information generated from a statistically significant number of subscribers, the  
6 simulated subscriber profile algorithm estimates the subscriber's age, education, sex and other  
7 relevant information. The analysis then compares information about the subscriber, for example  
8 the subscriber's programs watched information, with that of the test group. An example of the  
9 type of information maintained for a subscriber profile is presented below.

10 The subscriber profile data fields are an example of typical fields that can be used in  
11 the databases. Definitions of various fields are listed below. The primary purpose of profiling  
12 the subscriber is to acquire marketing information on the subscriber's likely response to  
13 available virtual objects. Ancillary information may be available including actual program  
14 selections or interactive virtual objects selections. Information tracked within the subscriber's  
15 profile includes:

16           Subscriber ID                   A unique identifier generated by the system, one for  
17    each subscriber using a specific reception site.

18           Reception site types           Boolean field that identifies the type of reception site  
19    used.

20           Reception site ID             ID of the reception site.

21           Hookup Date                  Date physical hardware is connected.

22           A demographic profile may be constructed for each subscriber from questionnaires or  
23           other sources. The following fields represent this demographic information:

24           Subscribers Age 2-5        Boolean field if the household has subscribers  
25    between 2 and 5 years of age.

26           Subscribers Age 6-11        Boolean field if the household has subscribers  
27    between 6 and 11 years of age.

1	Subscribers Age 12-17	Boolean field if the household has subscribers between 12 and 17 years of age.
2	Subscribers Age N1-N2	Boolean field if household has subscribers between N1 and N2 years of age.
3	Income	Annual household income.
4	Zip Code+4	Self-explanatory.
5	Occupancy	Number of subscribers in household.
6	Highest Education	Highest level of education of any subscriber in the household.
7	Field of Use	Personal, professional, educational, other.
8	Profession	Self-explanatory.
9	Education Level	Self-explanatory.

These subscriber profile inputs may assist in the assignment of reception sites to groups for each target category. There are numerous variations to the field definitions listed above, such as different age groupings, for example. Other subscriber profile data fields may also be specified.

Marketing information, such as the demographics of subscribers, may be received from a central data collection center 50, a local data collection center 40, other external sources, or directly from the reception sites using the subscriber data collection engine 1202. To effectively manage the virtual objects targeting operations, marketing information, such as the existence of markets for certain products, may be provided to the TVOMS 300. The following examples of information may be maintained in the subscriber information database 1210: subscriber demographic profile, subscriber buy information, and correlation of demographic information with buy information. The subscriber data collection engine 1202 gathers the marketing information from the various sources and indexes the information for inclusion in the subscriber information database 1210.

To maintain the subscriber information database 1210 within the TVOMS 300, a database server 1190, communications server 1191, subscriber workstation 1192 or stations,

1 or the suitable equivalents thereof, may be used, as depicted in Figure 11. The database server  
2 1190 supports saving database files, event logging, event scheduling, multi-subscriber services,  
3 database server services, and database security access.

4 The communications server 1191 performs the following functions on database data:  
5 integrity check, filtering, processing, downloading to reception sites using the pending  
6 commands database 1215, and uploading subscriber data from reception sites using the  
7 subscriber data collection engine 1202. The subscriber workstation 1192 allows for operator  
8 viewing and entry of subscriber data into the subscriber information database 1210.

9 Figure 12 shows an example of the configuration set-up system 1205 in more detail.  
10 An interface 1206 receives individual addressing information unique to reception sites. The  
11 interface 1206 can include a workstation, such as the workstation 1209, for example, from  
12 which an operator manually enters reception site information. Alternately, reception site  
13 information can be automatically entered at the interface 1206 by downloading from an off-site  
14 database, the Internet, a storage medium, such as a CD-ROM or a floppy disk, or by  
15 collecting the information directly from the individual reception sites using the subscriber data  
16 collection engine 1202 or provided by a central data collection center 50 or local data  
17 collection center 40. A processor 1207 processes the received reception site information and  
18 organizes the information for use. For example, the processor 1207 may create a  
19 Category/Group Definition Matrix as presented in Table A and a Group Assignment Matrix  
20 as presented in Table B that can be used to target virtual objects to groups of reception sites  
21 or to an individual reception site 30. In an alternative embodiment, if subscriber information  
22 is available where multiple subscribers may share a reception site 30, a Group Assignment  
23 matrix may be created for each subscriber who shares the reception site 30. The  
24 Category/Group Definition and Group Assignment matrices will be described in more detail  
25 later. The Category/Group Definition and Group Assignment matrices and organized reception  
26 site information are then stored in a database 1208, and are periodically updated as reception  
27 site information, for example, changes.

The information used by the processor 1207 to create a database of the Category/Group Definition and Group Assignment matrices includes, for example, the reception site identifier, subscriber identifier, zip code + 4 data, household income, and age and sex of the subscribers, for example. The information gathered by the configuration set-up system 1205 can come from a variety of sources including marketing databases, direct inputs from the subscribers, data collected by the subscriber data collection engine 1202, a central data collection center 50, a local data collection center 40, and other sources. Once the data are collected, the processor 1207 will assign category numbers to certain types of the data. For example, the ADI could be assigned category 1 and household (HH) income could be assigned category 2. Next, the configuration set-up system 1205 creates a number of non-overlapping groups for each category. For example, ADI can be broken down into Seattle, WA, Washington D.C., Denver CO., Los Angles CA, etc. Similarly, HH income can be broken down into a number of income groups such as no income, 20-40K, 40-60K, 60-120K, and over 120K. Then, the configuration set-up system 1205 assigns a "group mask representation" for each group within every category. The group mask representation may be simply a binary number that can be used to identify a particular group. Table A shows a completed Category/Group Definition matrix that could be used by the virtual object targeting system 1220 to assign targeted virtual objects to groups of reception sites or to individual reception sites.

**Table A - Category/Group Definition Matrix**

Category Number	Category Name	Group Number	Group Definition	Group Mask Representation
1	ADI	1	Seattle, WA	1000000000
		2	Washington, D.C.	0100000000
		3	Denver, CO	0010000000
		4	Los Angeles, CA	0001000000
2	HH income	1	No income	1000000000
		2	20-40K	0100000000
		3	40-60K	0010000000

Category Number	Category Name	Group Number	Group Definition	Group Mask Representation
1	3	4	60-120K	0001000000
		1	Group a	1000000000
		2	Group b	0100000000
		3	Group c	0010000000
		4	Group d	0001000000
		5	Group e	0000100000
		6	Group f	0000010000

2           The processor 1207 also creates the Group Assignment matrix. The Group  
 3           Assignment matrix, shown in Table B, assigns to each reception site 30, for each category, its  
 4           corresponding group number. Associated with each group number is the group definition and  
 5           the group mask representation. For example, the reception site 30 identified by the address  
 6           12311 is assigned group number 2 (i.e., Washington D.C.) for ADI, and group number 3 (i.e.,  
 7           40-60K) for household income. The Group Assignment matrix is updated periodically as  
 8           categories and group definitions change, and as data related to individual reception sites or  
 9           groups of reception sites change. Many other ways of organizing the information in a database  
 10          for later use are possible.

11           The configuration set-up system 1205 also delivers the group configuration (i.e.,  
 12          information specific to an individual reception site 30, from the Group Assignment matrix) to

13           Table B Group Assignment Matrix

Address	Target Category	Group Number	Group Definition	Group Mask Representation
12311	ADI	2	Washington, D.C.	01000000000
	HH income	3	40-60K	00100000000
	Category x	5	Group d	00100000000
12312	ADI	4	LA	00100000000
	HH income	3	60-120K	00100000000
	Category x	2	Group a	10000000000

Address	Target Category	Group Number	Group Definition	Group Mask Representation
12313	ADI	3	Denver	00100000000
	HH income	4	60-80K	00010000000
	Category x	3	Group b	01000000000

each reception site 30. For example, the reception site 30 assigned the address 12311 is sent for category 1, group mask representation 01000000000, indicating group 2 assignment.

The group configuration information can be stored in the pending commands database 1215 to be transmitted directly to each reception site 30 periodically or the next time the reception site 30 establishes communications operations center 10. Each time a group configuration message is generated, the message is stored in the pending commands database 1215.

Alternatively to the TVOMS 300 assigning the reception site 30 to individual groups for each category, the TVOMS 300 could deliver the group definitions and category definitions to the all reception sites. Each reception site 30 could then assign itself to the appropriate groups for each category based on internal processing algorithms.

Figure 13 shows an embodiment of the virtual object targeting system 1220 in more detail. A resource management engine 1305 uses information from a metadata extractor processor 1200 and an available virtual object database 1265 (see Figure 9) to determine the number of virtual objects to be assigned to a given virtual object location 37. A virtual object placement engine 1307 decides which virtual objects to place in virtual object locations in the content 36. A group assignment engine 1309 determines which reception sites will view specific virtual objects. The virtual object placement engine 1307 receives information from the resource management engine 1305 related to the number of virtual objects available, how many virtual objects are to be provided for a given virtual object location 37, and the actual type of virtual objects available.

The resource management engine 1305 functions to divide available delivery bandwidth among multiple virtual objects for a given virtual object location 37 in the content 36. Because

1 there may be a limited amount of resources on the delivery network 11 to deliver virtual objects  
2 with the content 36, the resource management engine 1305 may assign the available bandwidth  
3 optimally for the virtual objects associated with the individual virtual object locations within the  
4 content 36 being delivered over the communication channels. Some virtual object locations  
5 may be assigned multiple virtual objects, each targeted to a different group or groups, whereas  
6 other virtual object locations may be assigned only a single virtual object 38.

7 Referring to Table A, four group numbers (i.e., 1-4) are shown for the category of  
8 targeted virtual objects, ADI. For a particular virtual object location 37 in the content 36, the  
9 four groups can be divided into two, one for each available virtual object 38 of two total, with  
10 groups 1 and 2 receiving virtual object A and groups 3 and 4 receiving virtual object B, as  
11 shown for virtual object location 1. This later example is shown in Table C.

12 **Table C - Retrieval Plan**

13	Virtual Object 14 Location	Target Category	Virtual Object To Retrieve	Groups Assigned to Specific Virtual Object	Group Mask Assignment
15	Virtual Object Location 1	ADI	Virtual Object A	1, 2	11000000000
16			Virtual Object B	3,4	00110000000
17	Virtual Object Location 2	HH Income	Virtual Object A	1,2,3	11100000000
18			Virtual Object B	4	00010000000
19	Virtual Object Location 3	Category x	Virtual Object A	1,2	11000000000
20			Virtual Object B	3	00100000000
21			Virtual Object C	4	00010000000
22			Virtual Object D	5	00001000000
23			Virtual Object E	6	00000100000
24	Virtual Object Location 4	All	Virtual Object Al	All	11111111111

23 After determining how many virtual objects will be needed for each virtual object  
24 location 37 within the content 36, the resource management engine 1305 may also account for

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1 the type of available targeted virtual objects for display and the variety of subscribers  
2 (according to group assignment numbers) who may be viewing the content 36. An advertiser  
3 may provide this information when forwarding virtual objects for insertion.

4 In an embodiment, the virtual object placement engine 1307 determines which specific  
5 virtual objects are to be placed in each available virtual object location 37 within the content  
6 36. The virtual object placement engine 1307 first receives the list of selected available virtual  
7 objects from the metadata extractor processor 1200 (Figure 9). In cooperation with the  
8 resource management engine 1305, the virtual object placement engine 1307 then determines  
9 which of the available virtual objects should be placed in each virtual object location 37 within  
10 the content 36. For example, if the preferred target category for virtual object location 1 is  
11 ADI, the virtual object placement engine 1307 will select one or more targeted virtual objects  
12 determined by the metadata extractor processor 1200 to place in that virtual object location  
13 37. If the demographic or other data assembled by the configuration set-up system 1205  
14 indicates that more than one targeted virtual object 38 should be placed, depending on the  
15 ADI, then the virtual object placement engine 1307 will select the appropriate number of  
16 targeted virtual objects, and will assign each targeted virtual object 38 to the specific virtual  
17 object location 37. The operation of the virtual object placement engine 1307 to assign the  
18 targeted virtual objects will be described in more detail later.

19 In an embodiment, the group assignment engine 1309 receives inputs from the resource  
20 management engine 1305 and the virtual object placement engine 1307 and then determines  
21 which reception sites will view specific targeted virtual objects. Thus, for each virtual object  
22 location 37, the group assignment engine 1309 assigns the reception sites to one of the virtual  
23 objects. The reception sites can be assigned based on their placement within a group (i.e.,  
24 based on their group assignment number) or based on their individual reception site unit  
25 address. In tables B and C, the assignments are shown based on the group assignment  
26 numbers. As also shown in Table C, the group addressing for a virtual object location 37 may  
27 be based on a single category of targeting. This may avoid a conflict regarding which virtual  
28 object 38 a reception site 30 may retrieve.

1       The group assignment engine 1309 provides an output to the retrieval plan generator  
2       1275. The output indicates which group assignment numbers (i.e., which groups of reception  
3       sites) are assigned to a virtual object 38 for a given virtual object location 37 in the content 36.  
4       The retrieval plan generator 1275 then generates a bit word, or group mask assignment, that  
5       is used to assign the groups to virtual objects. Once generated, the retrieval plan is provided  
6       to the delivery processor 1300 for distribution along with the content 36 and the actual virtual  
7       objects to reception sites by object delivery center 15.

8       In an embodiment, the virtual object targeting system 1220 provides a virtual object  
9       generation request command 1261 to the content and virtual object packager 1260. The  
10      virtual objects generation request command 1261 specifies which particular virtual objects are  
11      to be displayed in a particular virtual object location 37, and the actual location of the virtual  
12      objects. The virtual object 38 is then retrieved from the available virtual object database 1265.  
13      The virtual objects, along with the retrieval plan, and content 36 and associated metadata  
14      packets are provided to the delivery processor 1300 for delivery to the appropriate reception  
15      sites.

16      When a reception site 30 receives the content 36 that contains targeted virtual objects,  
17      software instructions operating on the reception site 30 analyze the contents of the retrieval  
18      plan. Then, based on the groups assigned for each virtual object 38, the reception site 30  
19      retrieves those virtual objects that match its own group assignments for the target category  
20      being used for the virtual object location 37. The reception site 30 then associates those virtual  
21      objects retrieved with the appropriate virtual object location 37 where the virtual object 38 will  
22      be placed, so that when the content 36 is viewed, the virtual object 38 assigned to that virtual  
23      object location 37 is displayed.

24      An embodiment of the process for assigning targeted virtual objects using the virtual  
25      object placement engine 1307 is presented in Figure 14. The process begins with block 2360.  
26      In block 2362, the virtual object placement engine 1307 assigns reception sites to groups. In  
27      block 2364, the virtual object placement engine 1307 ties or relates virtual object locations in  
28      content 36 to the groups. In block 2366, the virtual object placement engine 1307 ties or

1 relates virtual objects to groups. In block 2368, the virtual object placement engine 1307  
2 determines how many virtual objects to assign to a virtual object location 37. In block 2370,  
3 the virtual object placement engine 1307 determines which target category to use for one or  
4 more virtual object locations 37. In block 2372, the virtual object placement engine 1307  
5 determines specific virtual objects to be placed in the virtual object locations 37. In block  
6 2374, the virtual object placement engine 1307 determines which groups to assign to the virtual  
7 objects 38 for the selected virtual object locations 37. The process ends with block  
8 2376.

9 As discussed in the above embodiment, virtual object targeting uses target categories  
10 and groups within each target category to tie or relate three entities together: 1) the reception  
11 site 30; 2) virtual objects; and 3) virtual object locations in content 36. In one embodiment of  
12 block 2362 in Figure 14, the reception sites are assigned to groups for each target category by  
13 the configuration set-up system 1205 based on numerous factors as described below. One  
14 method to assign the reception sites to groups is to use the zip code+4 as an index into one of  
15 the available demographic marketing databases. From the zip code+4 data, a distinct  
16 demographic cluster can be determined. The demographic cluster can then be mapped directly  
17 to the specific group within each target category. Manual assignment of groups to reception  
18 sites would be a daunting task for a large population of reception sites (approaching several  
19 million). Therefore, the processor 1207 in the configuration set-up system 1205 may perform  
20 this function automatically, using its installed software routines. Alternative methods can also  
21 be devised to automatically map individual reception sites to groups within target categories.  
22 Once each reception site 30 is mapped to one group for each target category, the group  
23 assignments may be delivered to the reception site 30 for storage.

24 In one embodiment of block 2364 in Figure 14, virtual object locations in content 36  
25 are tied or related to groups as described below. For each virtual object location 37, a group  
26 breakdown percentage can be defined for each group that represents the likely compatibility  
27 of the content 36 surrounding that virtual object location 37 with each group. Breakdown  
28 percentages for each virtual object location 37 are defined within the virtual object selector 200

1 (see Figure 8) and passed to the TVOMS 300. Table D shows a sample breakdown of these  
2 group breakdown percentages for five example virtual object locations for three example target  
3 categories.

4 The group breakdown percentage data may be derived from a number of sources  
5 including surveys, ratings services, and virtual objects viewed data collected by the reception  
6 sites, for example. In this example, the three target categories are the same as those presented  
7 in Table B, and the group assignment numbers are the same as those presented in Table A.  
8 Thus, target categories 1 and 2 each have four groups associated with them, and target  
9 category 3 has six groups associated with it. For virtual object location 1, the target category  
10 1 refers to ADI and under group 1, a group breakdown percentage of 25 percent is assigned  
11 for group 1 from the target category ADI since 25 percent of the subscribers reside in the  
12 Seattle, WA ADI. The group breakdown percentages for each target category for each virtual  
13 object location 37 may sum to 100 percent.

14 In an embodiment of the relating subroutine represented by block 2366 of Figure 14,  
15 virtual objects may be ranked according to their potential revenue generation for each group  
16 within one and up to all possible target categories, again using percentages. This information  
17 may be provided by an advertiser, programmer, or content provider responsible for the virtual  
18 objects and may reside in the available virtual objects database 1265. Table E shows a sample  
19 assignment of virtual object ranking percentages for eight sample virtual objects using the same  
20 target categories and group numbers as in Table D. Not all virtual objects may be assigned to  
21 groups for a target category if an advertiser or programmer does not wish its virtual objects to  
22 be targeted in the manner required by that target category. For example, an advertiser or  
23 programmer may want the same virtual object to be displayed at all reception sites 30,  
24 regardless of identical subscriber or group information or characteristics.

1                   Table D - Virtual Object Location Group Breakdown Percentages

2 3 4	Virtual object location	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
5 6 7	Virtual object location 1	1	25	25	25	25	N/A	N/A
8	"	2	30	10	20	40	N/A	N/A
9	"	3	10	20	30	40	N/A	N/A
10 11 12	Virtual object location 2	1	10	20	30	40	N/A	N/A
13	"	2	25	25	25	25	N/A	N/A
14	"	3	10	15	25	25	15	10
15 16 17	Virtual object location 3	1	40	30	20	10	N/A	N/A
18	"	2	80	10	5	5	N/A	N/A
19	"	3	25	25	10	10	15	25
20 21 22	Virtual object location 4	1	50	0	50	0	N/A	N/A
23	"	2	0	40	40	20	N/A	N/A
24	"	3	10	10	25	25	15	15
25 26 27	Virtual object location 5	1	20	30	30	20	N/A	N/A
28	"	2	30	30	10	30	10	10
29	"	3	10	30	10	30	10	10

31                   Referring to Table E, the data indicates that for virtual object 1, and target category 1  
 32 (ADI), the advertiser believes that virtual object 1 is appropriate for the subscribers in groups  
 33 1 and 2 and is not appropriate for the subscribers in groups 3 and 4. The advertiser also  
 34 believes that virtual object 1 is equally appropriate for both the group 1 and the group 2

1 subscribers. However, if the group 1 subscribers are determined to be more likely to respond  
2 to virtual object 1 than the group 2 subscribers, then group 1 could be given a higher  
3 percentage than group 2. Table E also shows that virtual object 1 is not applicable to groups  
4 5 and 6 because only four groups are defined for the target category ADI. Thus, all the  
5 reception sites will be grouped into one of groups 1 through 4.

6 Table E - Virtual Object Ranking Percentages

Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Virtual object 1	1	50	50	0	0	N/A	N/A
"	2	30	10	20	40	N/A	N/A
"	3	0	0	0	0	0	0
Virtual object 2	1	0	0	50	50	N/A	N/A
"	2	0	0	0	0	N/A	N/A
"	3	0	0	0	0	0	0
Virtual object3	1	0	0	0	0	N/A	N/A
"	2	25	25	25	25	N/A	N/A
"	3	0	0	0	0	0	0
Virtual object 4	1	50	0	50	0	N/A	N/A
"	2	0	40	40	20	N/A	N/A
"	3	10	30	10	30	10	10
Virtual object 5	1	40	20	20	40	N/A	N/A
"	2	10	30	30	30	N/A	N/A
"	3	30	30	30	5	5	0
Virtual object 6	1	0	0	0	0	N/A	N/A
"	2	0	0	0	0	N/A	N/A
"	3	10	10	10	10	30	30
Virtual object 7	1	20	40	40	20	N/A	N/A
"	2	25	25	25	25	N/A	N/A
"	3	0	30	20	30	0	20
Virtual object 8	1	30	40	0	30	N/A	N/A
"	2	30	30	10	30	N/A	N/A
"	3	20	0	20	20	20	20

32 Using this paradigm, virtual objects can be targeted using at least two methods. The  
33 first is a designated multi-virtual object campaign where specific unique sets of groups are  
34 assigned for each virtual object 38 of the campaign. In the second method, each virtual object  
35 38 provided by an advertiser is independently associated with groups. Virtual objects from  
36 several different advertisers are then used together to optimize use of virtual object locations.  
37 As depicted in Figure 14, blocks 2368, 2370, 2372, and 2374, the virtual object placement  
38 engine 1307 determines: 1) how many virtual objects are assigned to which virtual object

1 location; 2) which target category is used for which virtual object location; 3) which virtual  
2 objects to place in each virtual objects location; and 4) which groups are assigned to which  
3 virtual objects, respectively. To limit the need for excessive distribution bandwidth to distribute  
4 virtual objects to reception sites, the algorithm in the virtual object placement engine 1307 that  
5 assigns targeted virtual objects to the virtual objects assumes that there is a total number of  
6 virtual objects available [TOTAL\_VIRTUAL OBJECTS] for a segment of content 36 (across  
7 all virtual object locations), and assumes that no more than some maximum number of the  
8 virtual objects can be or are desired to be assigned to a given virtual object location 37. This  
9 amount is denoted as [MAX\_VIRTUAL OBJECTS].

10 Figure 15 presents an embodiment of a process used by the virtual object placement  
11 engine 1307 to execute the functions listed in blocks 2368, 2370, 2372, and 2374 depicted  
12 in Figure 14. The process begins with the start ellipse, 2318. In block 2320, the virtual object  
13 placement engine 1307 determines the virtual object 38 best suited for each virtual object  
14 location 37 for all target categories. In block 2322, the virtual object placement engine 1307  
15 determines the best virtual object/target category combination for each virtual object location  
16 37. In block 2324, the virtual object placement engine 1307 compares virtual object/target  
17 category combinations for all virtual object locations. In block 2326, the virtual object  
18 placement engine 1307, for a virtual object location 37 and target category, determines the best  
19 virtual objects to associate with the virtual object location 37. In block 2328, the virtual object  
20 placement engine 1307 repeats block 2326 for each target category. In block 2330, the virtual  
21 object placement engine 1307 determines the target category that yields the optimum placement  
22 of virtual objects for a virtual object location 37. In block 2332, the virtual object placement  
23 engine 1307 repeats blocks 2326, 2328, and 2330 for all virtual object locations. In block  
24 2334, the virtual object placement engine 1307 determines the best combination of multiple  
25 virtual objects for each virtual object location 37. In block 2336, for the remaining virtual  
26 object locations, the virtual object placement engine 1307 assigns the best matching virtual  
27 object 38. The process ends with block 2338.

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1           A further embodiment of a virtual objects targeting algorithm presented in Figure 15  
2 will be described with reference to the example values shown in Tables A-E. Various other  
3 prioritizing or ranking schemes may be used as described later.

4           Step 1: In block 2320 in Figure 15, the virtual object placement engine 1307, for a  
5 virtual object location 37, determines the virtual objects with the highest overall ranking if that  
6 virtual object 38 were the only virtual object 38 to be placed in a virtual object location 37 in  
7 the content 36. This step compares the data in Tables D and E. Figure 16 and the description  
8 that follows below present a more detailed embodiment of several of the blocks presented in  
9 Figure 15. In step 1a, as an embodiment of block 2421 in Figure 16, the virtual object  
10 placement engine 1307 selects the first virtual object location 37 and as an embodiment of  
11 block 2421 in Figure 16, selects the first virtual object 38 to be analyzed. As Step 1b, for that  
12 virtual object selected in Step 1a, the virtual object placement engine 1307 selects the first  
13 category, as an embodiment of block 2423 in Figure 16. Then, the virtual object placement  
14 engine 1307 multiplies the virtual object's Group Ranking Percentage by the virtual object  
15 location's Group Breakdown Percentage for each group as an embodiment of block 2424 in  
16 Figure 16 and sums the result, as an embodiment of block 2425 in Figure 16. As Step 1c, the  
17 virtual object placement engine 1307 repeats Step 1b for the next target category, as an  
18 embodiment of block 2426 in Figure 16. As Step 1d, the virtual object placement engine 1307  
19 repeats steps 1b and 1c for each virtual object 38, as an embodiment of block 2427 in Figure  
20 16. As Step 1e, for the virtual object location 37 under consideration, the virtual object  
21 placement engine 1307 selects the virtual object/target category that yields the highest summed  
22 value, as an embodiment of block 2428 in Figure 16. Then, for Step 1f, the virtual object  
23 placement engine 1307 repeats Steps 1b-1e for all virtual object locations, as an embodiment  
24 of block 2429 in Figure 16.

25           For example, using virtual object location 1, virtual object 1:

26           target category 1:      $50*25 + 50*25 + 0*25 + 0*25 = 25\%$

27           target category 2:      $30*30 + 10*10 + 20*20 + 40*40 = 30\%$

28           target category 3:      $0*10 + 0*10 + 0*20 + 0*20 + 0*20 = 0\%$

1           The cross-multiplied result then shows a measure of effectiveness for each virtual  
2           object 38 if displayed in the corresponding virtual object location 37. Table F below presents  
3           the results of Step 1 above for virtual object location 1.

4           Table F

5	6	7	8	9	Virtual object location / Virtual object	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Summation
10					1 / 1	1	12.5	12.5	0	0	0	0	25
						2	9	1	4	16	0	0	30
						3	0	0	0	0	0	0	0
11					1 / 2	1	0	0	12.5	12.5	0	0	25
						2	0	0	0	0	0	0	0
						3	0	0	0	0	0	0	0
12					1 / 3	1	0	0	0	0	0	0	0
						2	7.5	2.5	5	10	0	0	25
						3	0	0	0	0	0	0	0
13					1 / 4	1	12.5	0	12.5	0	0	0	25
						2	0	4	8	8	0	0	20
						3	1	3	2	6	2	2	16
14					1 / 5	1	10	5	5	5	0	0	25
						2	3	3	6	12	0	0	24
						3	3	3	6	1	1	0	14
15					1 / 6	1	0	0	0	0	0	0	0
						2	0	0	0	0	0	0	0
						3	1	1	2	2	6	6	18
16					1 / 7	1	5	5	10	5	0	0	25
						2	7.5	2.5	5	10	0	0	25
						3	0	3	4	6	0	4	17
17					1 / 8	1	7.5	10	0	7.5	0	0	25

<b>Virtual object location / Virtual object</b>	<b>Target Category</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>	<b>Group 4</b>	<b>Group 5</b>	<b>Group 6</b>	<b>Summation</b>
	2	9	3	2	12	0	0	26
	3	2	0	4	4	4	4	18

Step 2: Returning to Figure 15, for each virtual object location 37, the virtual object placement engine 1307, in block 2322, determines the virtual object/target category combination that results in the highest overall ranking. In one embodiment the virtual object placement engine 1307, lists the virtual object locations, the overall ranking, the corresponding virtual object 38, and the corresponding target category. In case of a tie, the virtual object placement engine 1307 selects any virtual object 38 with the overall highest ranking. Table G shows the results. Thus, from Table G, virtual object 4, a virtual object 38 displayed within virtual object location 4 yields a measure of effectiveness of 50 (highest) and virtual object 8 along within virtual object location 5 yields a measure of effectiveness of 28.

Table G

<b>Virtual Object Location</b>	<b>Highest Overall Ranking</b>	<b>Corresponding Virtual Object</b>	<b>Corresponding Target Category</b>
Virtual object location 1	30	Virtual Object 1	2
Virtual object location 2	35	Virtual Object 2	1
Virtual object location 3	35	Virtual Object 1	1
Virtual object location 4	50	Virtual Object 4	1
Virtual object location 5	28	Virtual Object 8	2

Step 3: In one embodiment of block 2324 in Figure 15, the virtual object placement engine 1307 orders the resulting list of virtual object locations from Step 2 from lowest overall ranking to highest overall ranking to compare virtual object/target category combinations for virtual object locations. Table H shows the results.

Table H

Virtual Object Location	Overall Ranking	Corresponding Virtual Object	Corresponding Target Category
Virtual object location 5	28	Virtual Object 8	2
Virtual object location 1	30	Virtual Object 1	2
Virtual object location 2	35	Virtual Object 2	1
Virtual object location 3	35	Virtual Object 1	1
Virtual object location 4	50	Virtual Object 4	1

Step 4: In one embodiment of block 2326 in Figure 15, the virtual object placement engine 1307 uses the process shown in Figure 17 to determine the best virtual objects to associate with a virtual object location 37. The block begins with ellipse 2440. In block 2441 in Figure 17, the virtual object placement engine 1307 selects the virtual object location 37 from Step 3 resulting in the lowest overall ranking. As Step 4a, for the selected virtual object location 37, the virtual object placement engine 1307 selects the first target category, as an embodiment of block 2442 in Figure 17. As Step 4b, the virtual object placement engine 1307 assembles a table showing the product of each virtual object Group Ranking Percentage and virtual object location Group Breakdown Percentage combination. Table I below provides an example for virtual object location 5 and target category 1.

Table I

Virtual Object Location / Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4	Summation
5 / 1	1	10	15	0	0	25
5 / 2	1	0	0	15	10	25
5 / 3	1	0	0	0	0	0
5 / 4	1	10	0	15	0	25
5 / 5	1	8	6	6	4	24
5 / 6	1	0	0	0	0	0
5 / 7	1	4	6	12	4	26
5 / 8	1	6	12	0	6	24

As Step 4c, as an embodiment of block 2443 in Figure 17, the virtual object placement engine 1307 finds the product that is the highest. In case of a tie, the virtual object placement engine 1307 selects the product that corresponds to the highest summation value for that virtual object location / virtual object combination. In case a tie still persists, the virtual object placement engine 1307 selects any of the cells with an equivalent value. Table J below shows the previous example continued where group 2 for virtual object location / virtual object combination 5/1 is selected.

Table J

Virtual Object Location / Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4	Summation
5 / 1	1	10	*15*	0	0	25
5 / 2	1	0	0	15	10	25
5 / 3	1	0	0	0	0	0
5 / 4	1	10	0	15	0	25
5 / 5	1	8	6	6	4	24
5 / 6	1	0	0	0	0	0

	<b>Virtual Object Location / Virtual Object</b>	<b>Target Category</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>	<b>Group 4</b>	<b>Summation</b>
1	5 / 7	1	4	6	12	4	26
2	5 / 8	1	6	12	0	6	24

Step 5: As an embodiment of block 2444 in Figure 17, the virtual object placement engine 1307 finds the product that is next highest (or the same value as in Step 4), but that is associated with a group not yet selected. Again, in case of a tie, the virtual object placement engine 1307 selects the product that corresponds to the highest summation value for that virtual object location / virtual object combination. In case a tie still persists, the virtual object placement engine 1307 selects any of the cells with an equivalent value. Table K below shows the previous example continued.

Table K

	<b>Virtual Object Location / Virtual Object</b>	<b>Target Category</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>	<b>Group 4</b>
15	5 / 1	1	*10*	*15*	0	0
16	5 / 2	1	0	0	*15*	*10*
17	5 / 3	1	0	0	0	0
18	5 / 4	1	10	0	15	0
19	5 / 5	1	8	6	6	4
20	5 / 6	1	0	0	0	0
21	5 / 7	1	4	6	12	4
22	5 / 8	1	6	12	0	6

Step 6: As an embodiment of block 2446 in Figure 17, the virtual object placement engine 1307 repeats Step 5 until a product has been selected for all groups. Table L below continues the example.

Table L

Virtual Object Location / Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4
5 / 1	1	*10*	*15*	0	0
5 / 2	1	0	0	*15*	*10*
5 / 3	1	0	0	0	0
5 / 4	1	10	0	15	0
5 / 5	1	8	6	6	4
5 / 6	1	0	0	0	0
5 / 7	1	4	6	12	4
5 / 8	1	6	12	0	6

Step 7: As an embodiment of block 2448 in Figure 17, for all virtual objects with products cells selected in Step 6, the virtual object placement engine 1307 calculates the summed products of those selected cells for each virtual object 38. Table M below shows the results.

Table M

Virtual Object Location / Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4	Summation
5 / 1	1	*10*	*15*	0	0	25
5 / 2	1	0	0	*15*	*10*	25
5 / 3	1	0	0	0	0	0
5 / 4	1	10	0	15	0	0
5 / 5	1	8	6	6	4	0
5 / 6	1	0	0	0	0	0
5 / 7	1	4	6	12	4	0
5 / 8	1	6	12	0	6	0

1                   Step 8: As an embodiment of block 2450 in Figure 17, the virtual object placement  
2 engine 1307 orders the virtual objects in Step 7 from highest summed value to lowest. In case  
3 of equal summed values, the virtual object placement engine 1307 arbitrarily orders those  
4 virtual objects with the same summed value. Table N presents the example results.

5                   Table N

6                   Virtual Object 7                   Location / 8                   Virtual Object	Target Category	Group 1	Group 2	Group 3	Group 4	Summation
9                   5 / 1	1	10	15	0	0	25
10                  5 / 2	1	1	0	15	10	25

11  
12                   Step 9: As Step 9a, if the number of virtual objects selected in Step 8 exceeds  
13 [MAX\_VIRTUAL OBJECTS], the virtual object placement engine 1307 selects the first  
14 [MAX\_VIRTUAL OBJECTS] virtual objects with the summed value as an embodiment of  
15 block 2452 in Figure 17. For example, if it is desired to assign at most two virtual objects to  
16 a virtual object location 37, the virtual object placement engine 1307 selects the two virtual  
17 objects with the highest virtual object Group Ranking Percentage and virtual object location  
18 Group Breakdown Percentage products. Next, as Step 9b, for the unselected virtual objects,  
19 the virtual object placement engine 1307 determines those groups that were associated with  
20 these omitted virtual objects, as an embodiment of block 2454 in Figure 17.

21                   Step 10: As an embodiment of block 2456 in Figure 17, for the virtual objects  
22 associated with the groups determined in Step 9b, the virtual object placement engine 1307  
23 selects the product within that group that is the highest for the [MAX\_VIRTUAL OBJECT]  
24 selected virtual objects from Step 9a. The virtual object placement engine 1307 recalculates  
25 the summed products of those selected groups cells for each of the virtual objects. Table O  
26 below provides a new example, assuming [MAX\_VIRTUAL OBJECTS] = 2; therefore,  
27 groups 5 and 6, which are associated with virtual object 6, may be reallocated to virtual objects  
28 7 & 5, respectively.

1                   Table O

2                   Result before Step 10 is shown below:

3 4 5 6 7 Virtual object location / Virtual object	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Summation
8 5 / 7	3	0	*9*	2	*9*	0	2	18
9 5 / 5	3	*3*	9	*3*	1.5	0.5	0	6
10 5 / 6	3	1	3	1	3	*3*	*3*	6

11                  Result after Step 10 is shown below:

12 13 14 15 16 Virtual object location / Virtual object	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Summation
17 5 / 7	3	0	*9*	2	*9*	0	*2*	20
18 5 / 5	3	*3*	9	*3*	1.5	*0.5*	0	6.5
19 5 / 6	3	1	3	1	3	3	3	0

20                  Step 11: As an embodiment of block 2458 in Figure 17, the virtual object placement  
 21 engine 1307 calculates the total summed product value for all virtual objects selected in Step  
 22 10. From Table P, this value is 26.5. The resultant groups selected for each virtual object 38  
 23 will serve as the group assignments if this virtual object location / target category ultimately  
 24 results in the best match, as determined in the remaining steps of the algorithm.

25                   Table P

26 27 28 29 30 Virtual object location / Virtual object	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Summation
31 5 / 7	3	0	*9*	2	*9*	0	*2*	20
32 5 / 5	3	*3*	9	*3*	1.5	0.5	0	6.5

<b>Virtual object location / Virtual object</b>	<b>Target Category</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>	<b>Group 4</b>	<b>Group 5</b>	<b>Group 6</b>	<b>Summation</b>
1								Total summed product values      26.5

2                    Step 12: The virtual object placement engine 1307 repeats steps 4-11 above for the  
 3                    same selected virtual object location 37 of Step 4 using the remaining target categories, as an  
 4                    embodiment of block 2328 in Figure 15. The Table Q example below provides the output  
 5                    results for each of the three example target categories.

6                    Table Q

<b>Virtual object location / Virtual object</b>	<b>Target Category</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>	<b>Group 4</b>	<b>Summation</b>
5 / 1	1	*10*	*15*	0	0	25
5 / 2	1	0	0	*15*	*10*	25
Total summed product values						50

<b>Virtual object location / Virtual object</b>	<b>Target Category</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>	<b>Group 4</b>	<b>Group 5</b>	<b>Group 6</b>	<b>Summation</b>
5 / 1	2	*9*	3	2	*12*	0	0	21
5 / 4	2	0	*12*	*4*	6	0	0	16
Total summed product values								37

Virtual object location / Virtual object	Target Category	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Summation
5 / 7	3	0	*9*	2	*9*	0	*2*	20
5 / 5	3	*3*	9	*3*	1.5	*0.5*	0	6.5
Total summed product values								26.5

Step 13: As an embodiment of block 2330 in Figure 15, the virtual object placement engine 1307 selects the target category that yields the highest total summed product amount. The virtual object placement engine 1307 assigns this as the Maximum Rank for that virtual object location 37. In the case above, the virtual object placement engine 1307 would assign target category 1, with a value of 50 that is selected.

Step 14: As an embodiment of block 2332 in Figure 15, the virtual object placement engine 1307 repeats Steps 4-13 for the virtual object location 37 selected in Step 4 with the next lowest overall ranking, computing the Maximum Rank for each virtual object location 37.

Step 15: As an embodiment of block 2334 in Figure 15, the virtual object placement engine 1307 uses the available [MAX\_VIRTUAL OBJECTS] virtual objects for the virtual object locations up to the maximum number of [TOTAL\_VIRTUAL OBJECTS] that yield the largest Maximum Rank. The virtual object placement engine 1307 makes use of the relevant target category determined in Step 13, with virtual objects as determined in Step 10, with group assignments as determined in Step 11.

Step 16: As an embodiment of block 2336 in Figure 15, for all other virtual object locations, the virtual object placement engine 1307 assigns the single virtual objects that yielded the highest Overall Ranking as determined in Step 2.

The above algorithm performed by the virtual object placement engine 1307 is meant to be illustrative and not limiting. Other algorithms are possible for assigning targeted advertising to groups of reception sites or to individual reception sites. Other targeted advertising routines can also be used by the virtual object placement engine 1307.

1       The above algorithm can be simplified in the case where virtual objects are being  
2 selected to be delivered with the content 36 to be received by a single subscriber or reception  
3 site 30. In this case, prior to initiating the steps in the algorithm, the virtual object location  
4 Group Breakdown Percentages table may be modified to display a group breakdown  
5 percentage of 0 for all groups that the subscriber does not belong to for each target category.

6           An alternate virtual object targeting routine 1374 is described in U.S. Patent  
7 5,600,364, to Hendricks, John S, entitled NETWORK CONTROLLER FOR CABLE  
8 TELEVISION DELIVERY SYSTEM, which is hereby incorporated by reference. In this  
9 alternative, software in the virtual object targeting system 1220 generates packages of virtual  
10 objects geared towards particular subscribers and makes use of a subscriber's demographic  
11 information and viewing habits to determine those virtual objects that are of most interest to that  
12 particular subscriber. The routine 1374 then outputs packages of virtual objects targeted  
13 towards each subscriber or group of subscribers.

14          Figure 18 shows the seven primary functions of an alternate virtual object targeting  
15 routine 1374. The function of the routine 1374 is to target virtual objects for reception sites  
16 based on historical programs watched data and other data that is available at the TVOMS 300.  
17 In the discussion that follows, the alternate virtual object targeting routine 1374 is described as  
18 executed at the TVOMS 300.

19          The process may be initiated as shown at initiation ellipse 1420. In the first subroutine,  
20 identified at block 1422, the virtual object targeting system 1220 determines the programs  
21 watched matrices stored in the subscriber information database 1210. The determine programs  
22 watched matrices subroutine 1422 uses a unique reception site ID to access a specific matrix  
23 for one reception site. These matrices are maintained and updated by periodic collections by  
24 the operations center 10 of accumulated information from the reception sites.

25          In the second subroutine, shown at block 1424, the virtual object targeting system  
26 1220 develops other matrices based on other available information. To develop other matrices  
27 based on other available information subroutine 1424 is an optional subroutine not required for  
28 the functioning of the system. For groups of reception sites or for each individual reception site,

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1       matrices may be developed based on the demographic information, billing information, pricing  
2       information, age information and other information that may be stored in the subscriber  
3       information database 1210.

4              In the process matrices through correlation algorithms subroutine, block 1426, the  
5       virtual object targeting system 1220 processes all matrices through a set of correlation  
6       algorithms. In particular, the virtual object targeting system 1220 takes matrices developed in  
7       the first two subroutines 1422 and 1424 and processes the matrices until reaching a final matrix.

8              Figure 19 shows an embodiment of the matrices processing subroutine 1426 that is  
9       called by the virtual objects targeting sequence 1374 shown in Figure 18. As shown in Figure  
10      19, the virtual object targeting system 1220 initiates the matrices processing subroutine 1426  
11      at initiation ellipse 1427 and then accesses or queries, at block 1420, the programs watched  
12      file and gathers information regarding either an individual subscriber or a group of subscribers.  
13      The virtual object targeting system 1220 can gather the programs watched information in this  
14      way for individual subscribers or a group of subscribers.

15              Once the programs watched information has been gathered in the database, the virtual  
16       object targeting system 1220 selects and groups, at block 1430, programs watched categories  
17       and time periods. The software initially takes each program category (e.g., sports, news,  
18       mysteries, etc.) and determines the number of programs watched for a given time. The periods  
19       may be set to any length of time, including, for example, one, two, three or four weeks. The virtual  
20       object targeting system 1220 will loop through such a counting process for each group  
21       and period and then proceed to build a programs watched matrix, at block 1432, based on the  
22       program categories and periods. Essentially, all programs watched in a particular category and  
23       time period will be entered into the programs watched matrix. Once the matrix has been built,  
24       the virtual object targeting system 1220, using matrices processing subroutine 1426, will  
25       process the matrix for a given subscriber or group of subscribers through the correlation  
26       algorithms.

27              A number of correlation algorithms may be used to weight each selected program  
28       category. For example, as shown at block 1434, the virtual object targeting system 1220 may

1 use a sum of squares algorithm to determine the weighting. Once weighted, the weighted  
2 categories will be correlated by the virtual object targeting system 1220 at block 1436, with  
3 various virtual objects stored in the available virtual objects database 1265. The virtual object  
4 targeting system 1220 then selects a set of the most heavily weighted virtual objects for  
5 inclusion within the content 36 to be delivered to individual subscribers or groups of  
6 subscribers. Having determined the weightings of each group and prioritizing the groups  
7 accordingly, the virtual object targeting system 1220 returns, block 1438, to the virtual objects  
8 targeting sequence 1374 of Figure 18.

9 Referring back to Figure 18, in the fourth subroutine, as represented at block 1428,  
10 the virtual object targeting system 1220 uses the final matrix developed by the correlation and  
11 weighing algorithm described above, to select a grouping (or selective filter) for each reception  
12 site 30. The final groupings of virtual objects that may be sent to the reception sites or group  
13 of reception sites may use a subroutine as diagramed in Figure 20.

14 The fourth subroutine 1428, depicted in Figure 20, is called or initiated by the virtual  
15 objects targeting sequence 1374 of Figure 18 in order to determine the final groupings. In the  
16 subroutine shown at block 1444, the virtual object targeting system 1220 selects a set of virtual  
17 objects that will be used in the chosen groupings. This selection process may involve virtual  
18 objects from various virtual objects categories. Each virtual object 38 may subsequently be  
19 assigned a number of times that it will be shown in a given segment of content 36. The  
20 frequency of display may be based on various factors, including the number of requests and  
21 cost paid by the respective advertisers to have the virtual objects displayed, as shown in block  
22 1446. Such factors may be used by the virtual object targeting system 1220 in the next step  
23 of the subroutine, at block 1448, at which the virtual object targeting system 1220 assigns a  
24 weighting to specific virtual objects in each virtual objects category. These weightings are used  
25 to prioritize the virtual objects that will be sent to individual reception sites or group of reception  
sites.

27 Once the virtual objects have been weighted, the virtual object targeting system 1220  
28 executes a correlation algorithm, at block 1450, using selected criteria (i.e., the various factors

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1 used to weight the virtual objects) as well as the output of each programs watched matrix. Any  
2 number of correlation algorithms and weighting algorithms may be used, including the sum of  
3 squares weighting algorithm described above.

4 The results from the correlation algorithm subsequently determine the virtual objects  
5 and program content 36 that is sent to the virtual object targeting system 1220 for distribution.  
6 Once the virtual object targeting system 1220 at the fourth subroutine 1428 completes these  
7 steps, the subscriber information database 1210 updates the subscriber record based on the  
8 virtual objects that are sent, as shown at block 1454. The database update allows the  
9 advertisers to track the costs and frequency of the virtual objects targeted to specific reception  
10 sites or groups of reception sites. Following the updates, the virtual object targeting system  
11 1220 returns to the virtual objects targeting sequence shown in Figure 18, block 1456.

12 Referring to Figure 21, reception site groupings (1 through 5) 1460 are shown. The  
13 number of reception site groupings available may be determined by the bandwidth available to  
14 transmit virtual objects along with content 36. The available bandwidth or resources provided  
15 by the delivery network 11 may limit the number of virtual objects that are available to  
16 distribute to the reception site 30.

17 Referring back to Figure 18, the virtual object targeting system 1220 at the fifth  
18 subroutine, represented at block 1466, prepares reception site group information for  
19 transmission to the reception sites along with the requested content 36.

20 In the sixth subroutine, block 1468, the virtual object targeting system 1220 selects  
21 the targeted virtual objects. The sixth subroutine 1468 is the last decision making process in  
22 displaying a targeted virtual objects for a subscriber. As shown in block 1469, the reception  
23 site 30 then displays the targeted virtual objects with the content 36.

24 As noted above, targeted advertising can be based on viewing a specific program or  
25 a category of programming content 36. In an embodiment, the reception site 30 performs this  
26 last step by correlating (or matching) the program being watched by the subscriber with the  
27 reception site group information that has been previously transmitted by the TVOMS 300.  
28 Figure 21 shows an exemplary table matching reception site groups 1460 and program

1 categories 1470 with specific virtual objects. The virtual objects are shown in Figure 22 at  
2 1474 and are assigned Roman numerals I through X, for example. The number of reception  
3 site groupings and virtual objects can vary. Figure 22 shows a division of available bandwidth  
4 to carry ten virtual objects. In this example, the virtual objects 1474 are numbered  
5 1101-1110.

6 The TVOMS 300 will transmit group information to a reception site 30 shown as row  
7 names 1460 on Figure 21. The TVOMS 300 will also transmit data that informs the reception  
8 site 30 which of the multiple virtual objects 1474 is assigned to a program category shown as  
9 columns 1470 on Figure 21. Each reception site 30 only requires the data related to that  
10 reception site's assigned group (or row). For example, in Figure 21, the reception site 30 in  
11 group 1 (row 1) is provided with data on the virtual objects which are assigned for sports  
12 program as I, children's program as IV and mystery category program as III. In this manner,  
13 each reception site 30 is only required to store information related to its own grouping.  
14 Therefore, a reception site 30 that is in group 1 only needs to store the information related to  
15 group 1 that is found in row 1 of Figure 21.

16 Figure 23 shows a software program flow 1490 that is an alternative to the virtual  
17 object targeting system 1220 targeting routine 1374, depicted in Figure 18. The alternative  
18 routine 1490 allows each reception site 30 to be individually targeted with specific virtual  
19 objects. Preferably, it is initiated automatically, as shown at block 1492, by the TVOMS 300  
20 upon receipt of a program request from a reception site, for example, for a pay per view  
21 program. Thus, once the TVOMS 300 receives program request information from a reception  
22 site, the TVOMS 300 begins the process of selecting a package of virtual objects that may be  
23 based on, among other things, that subscriber's demographic information and viewing  
24 history.

25 Upon receipt of a program request from a reception site, the virtual object targeting  
26 system 1220 reads the reception site identifier, as shown at block 1494, and the program  
27 requested. The subscriber data collection engine 1202 writes information on the program

1 requested to the subscriber information database 1210, updating the subscriber record that  
2 contains listings of all programs requested within the past week, month or year.

3 With continued reference to Figure 23, the virtual object targeting system 1220 then  
4 calls a subroutine that sorts the programs requested by program category, block 1498. In turn,  
5 the program categories are sorted, as shown at block 1500, based on the number of times that  
6 program appearing in each particular category is requested. In so doing, virtual object targeting  
7 system 1220, using the sorting subroutine as shown at block 1500, determines and ranks those  
8 programs and program categories that are most frequently viewed at that reception site.

9 All rankings of programs and program categories for that reception site 30 are written  
10 to the subscriber information database 1210, as shown at block 1502.

11 Next, the virtual object targeting system 1220 calls a subroutine, shown at block  
12 1504, that correlates the updated subscriber record with the available virtual objects database  
13 1265. By correlating these two with one another, the subroutine assigns or correlates various  
14 categories of virtual objects to each ranking of programs and program categories. The  
15 categories of virtual objects that may be so assigned are found in the available virtual objects  
16 database 1265 and may include: (1) Household Goods/Products, (2) Home Improvement and  
17 Maintenance, (3) Personal Hygiene, (4) Entertainment Items and Events, (5) Sporting Goods  
18 and Events, (6) Motor Vehicles and Related Products, (7) Foodstuffs and Beverages, and (8)  
19 Miscellaneous, for example. Where, for example, the subscriber has watched a sporting  
20 program, the Sporting Goods and Events, Home Improvement and Maintenance categories  
21 may be assigned to that particular sporting event/ program and Sports program category, for  
22 example.

23 Once the programs and program categories are correlated with the virtual objects  
24 categories in the available virtual objects database 1265, the virtual object targeting system  
25 1220 calls a sorting subroutine 1506 that ranks the correlated virtual objects categories based  
26 on other information in the database files. In one embodiment, this ranking is primarily based  
27 on data in the updated subscriber information database 1210, as shown at block 1506. By  
28 using data on the subscriber's past program selections and demographic information, the virtual

1 object targeting system 1220 ranks the correlated categories of virtual objects according to  
2 those likely to be of most interest to that subscriber.

3 After the virtual object categories have been sorted and ranked, the virtual object  
4 targeting system 1220 selects the top three virtual objects categories as the targeted categories  
5 for a given program and subscriber, block 1508. Individual virtual objects are then chosen  
6 from the available virtual objects database 1265, with all selections made from the targeted  
7 categories, at block 1510. The virtual objects that are selected are written to the subscriber  
8 information database 1210 and to the content and virtual object packager 30, from where  
9 packages can be generated, at block 1512, for ultimate delivery to the reception site.

10 Figure 24 depicts the object delivery center 15. The object delivery center 15  
11 receives content 36, virtual objects, retrieval plans, and other information from the operations  
12 center 10 that is to be transmitted to reception sites. The communication processor 16 in the  
13 object delivery center 15 may determine the delivery network and communications methods  
14 appropriate for each item to be delivered, may combine items to be delivered to common  
15 destinations, may format the items for delivery, and provide the formatted items to the  
16 processing router 17. The processing router 17 may then route each item to the appropriate  
17 modular connector 700, for example modular connector 700', modular connector 700", or  
18 modular connector 700"', depending on the required delivery network 11 and communication  
19 method.

20 A number of embodiments of delivery network 11 are presented below. The  
21 embodiments presented below may use the object delivery center 15, which inserts the virtual  
22 objects into the signal for delivery over the delivery network 11. The embodiments presented  
23 below use a modular connector 700 in the reception site 30, that receives the delivered signal  
24 with virtual objects, extracts the virtual objects, and provides the virtual objects to the storage  
25 management processor 710. The modular connector 700 supports the receive functionality for  
26 each unique delivery network 11 communication method embodiment.

27 Figure 25 presents embodiments associated with the delivery of virtual objects over  
28 a coaxial or fiber cable system 2701 to a reception site 30. Virtual objects are provided to the

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1 delivery network 11 by the object delivery center 15 or directly by the operations center 10.  
2 The signal is delivered over the cable system 2701. The signal may provide for the delivery of  
3 virtual objects, content 36 containing virtual object locations, and reception site configuration  
4 and control information. The signal may also provide for virtual object viewing data and  
5 interactive virtual object requests from the reception site 30 to the local data collection center  
6 40, to the central data collection center 50, or to the interactive object service center 60 or the  
7 signal may be a means to provide access to the Internet or other public network through which  
8 virtual objects or content 36 are delivered (not shown). The cable system 2701 may be a  
9 coaxial cable network, totally fiber network, hybrid fiber coax network, fiber to the curb  
10 network, or any other cable distribution technology. The signal over the cable system may be  
11 generated by a cable modem, in which an external cable modem 2702 is used to receive the  
12 signal and provide the embedded virtual objects to the modular connector 700 in the reception  
13 site 30 for processing. Alternatively, the reception site 30 may contain an internal cable modem  
14 2705, which receives the signal and provides the virtual objects to the modular connector 700  
15 for processing.

16 In another embodiment, the signal delivered over the cable system is a video signal.  
17 In one embodiment, the video signal is an analog video signal. In another embodiment, the  
18 video signal is a digital video signal. The reception site 30 may contain an internal cable  
19 receiver/tuner/demodulator 2706 to process the signal, and provide the embedded virtual  
20 objects to the modular connector 700. A set top terminal 2703, or other device capable of  
21 receiving a cable video signal, such as a cable ready TV, or PC with cable tuner (not shown),  
22 may process the video signal and deliver the video signal to the connector 700 in the reception  
23 site 30, which extracts the embedded virtual objects. Alternately, the set top terminal 2703,  
24 or other such device, may extract the embedded virtual objects from the video signal and  
25 provide the virtual objects to the modular connector 700 in the reception site 30.

26 In another embodiment, virtual objects may be embedded within the audio signal,  
27 requiring an appropriate audio-capable modular connector 700 in the reception site 30 to

1 extract the virtual objects from the audio signal. In one embodiment, the audio signal is an  
2 analog audio signal. In another embodiment, the audio signal is a digital audio signal.

3 In yet another embodiment, the signal is a spread spectrum signal containing a digital  
4 data stream, requiring an appropriate spread spectrum receiver and modular connector 700  
5 in the reception site 30 to extract the virtual objects. In this embodiment, the spread spectrum  
6 signal is transmitted in the same bandwidth as the video or audio signal, but below the noise  
7 level.

8 Figure 26 presents embodiments associated with the delivery of virtual objects over  
9 a wireless broadcast system 2801 to a reception site 30. Virtual objects are provided to the  
10 delivery network 11 by the object delivery center 15 or directly by the operations center 10.  
11 The signal is delivered over the wireless broadcast system 2801. The signal may provide for  
12 the delivery of virtual objects, content 36 containing virtual object locations, and reception site  
13 configuration and control information. The signal may also provide for virtual object viewing  
14 data and interactive virtual object requests from the reception site 30 to the local data collection  
15 center 40, to the central data collection center 50, or to the interactive object service center  
16 60 or the signal may be a means to provide access to the Internet or other public network  
17 through which virtual objects or content 36 are delivered. The wireless broadcast system may  
18 be a microwave multipoint delivery system (MMDS), local multipoint distribution system  
19 (LMDS), Instructional Television Fixed Service (ITFS) system, or any other wireless data,  
20 video, or telephony broadcast system, including point-to-point and point-to-multipoint  
21 microwave broadcast systems like those provided by Teligent, Winstar digital wireless  
22 network, and ATT's wireless system. The signal over the wireless broadcast system may be  
23 generated by a wireless modem, in which an external wireless modem 2802 is used to receive  
24 the signal and provide the embedded virtual objects to the modular connector 700 in the  
25 reception site 30 for processing. Alternatively, the reception site 30 may contain an internal  
26 wireless modem 2805, which receives the signal and provides the virtual objects to the modular  
27 connector 700 in the reception site 30 for processing.

1           In another embodiment, the signal delivered over the wireless broadcast system is a  
2 video signal. In one embodiment, the video signal is an analog video signal. In another  
3 embodiment, the video signal is a digital video signal. The reception site 30 may contain an  
4 internal wireless receiver/tuner/demodulator 2806 to process the signal, and provide the  
5 embedded virtual objects to the modular connector 700. A wireless set-top terminal 2803, or  
6 other device capable of receiving a wireless video signal, such as a TV, or PC with a wireless  
7 receiver and tuner, may process the video signal and deliver the video signal to the modular  
8 connector 700 in the reception site 30, which extracts the embedded virtual objects.  
9 Alternately, the set top terminal 2803, or other such device, may extract the embedded virtual  
10 objects from the video signal and provide the data to the modular connector 700 in the  
11 reception site 30.

12           In another embodiment, virtual objects may be embedded within the audio signal,  
13 requiring an appropriate audio-capable modular connector 700 in the reception site 30 to  
14 extract the virtual objects from the audio signal. In one embodiment, the audio signal is an  
15 analog audio signal. In another embodiment, the audio signal is a digital audio signal.

16           In yet another embodiment, the signal is a spread spectrum signal containing a digital  
17 data stream, requiring an appropriate spread spectrum receiver modular connector 700 in the  
18 reception site 30 to extract the virtual objects. In this embodiment, the spread spectrum signal  
19 is transmitted in the same bandwidth as the video or audio signal, but below the noise level.

20           Figure 27 presents embodiments associated with the delivery of virtual objects over  
21 a satellite broadcast system 2901 to a reception site 30. Virtual objects are provided to the  
22 delivery network 11 by the object delivery center 15 or directly by the operations center 10.  
23 The signal is delivered over the satellite broadcast system 2901. The signal may provide for  
24 the delivery of virtual objects, content 36 containing virtual object locations, and reception site  
25 configuration and control information. The signal may also provide for virtual object viewing  
26 data and interactive virtual object requests from the reception site 30 to the local data collection  
27 center 40, to the central data collection center 50, or to the interactive object service center  
28 60 or the signal may be a means to provide access to the Internet or other public network

1 through which virtual objects or content 36 are delivered. The satellite broadcast system 2901  
2 can be a direct broadcast system like DirecTV and EchoStar, a direct to home satellite  
3 broadcast system, video network distribution broadcast system, a point-to-point or  
4 point-to-multipoint data VSAT system, a digital audio broadcast system like WorldSpace, CD  
5 Radio, or XM, or a mobile data and telephony satellite broadcast system like Iridium,  
6 Teledesic, or Globalstar. Alternatively, the satellite broadcast system can be regionalized  
7 broadcast services or store and forward communication services hosted on high flying balloons  
8 or on airplanes that provide communication repeater services to a small geographic region.  
9 The signal over the satellite broadcast system may be generated by a satellite data modem, in  
10 which an external satellite data receiver 2902 is used to receive the signal and provide the  
11 embedded virtual objects to the reception site 30 modular connector 700 for processing.  
12 Alternatively, the reception site 30 may contain an internal satellite receiver 2905, which  
13 receives the signal and provides the virtual objects to the modular connector 700 in the  
14 reception site 30 for processing.

15 In another embodiment, the signal delivered over the satellite broadcast system is a  
16 video signal. In one embodiment, the video signal is an analog video signal. In another  
17 embodiment, the video signal is a digital video signal. The reception site 30 may contain an  
18 internal satellite video receiver 2906 to process the signal, and provide the embedded virtual  
19 objects to the modular connector 700. A satellite receiver 2903, or other device capable of  
20 receiving a satellite video signal, such as a TV, or PC with satellite receiver, may process the  
21 video signal and deliver the video signal to the modular connector 700 in the reception site 30,  
22 which extracts the embedded virtual objects. Alternately, the satellite receiver 2903, or other  
23 such device, may extract the embedded virtual objects from the video signal and provide the  
24 data to the modular connector in the reception site 258.

25 In another embodiment, virtual objects may be embedded within the audio signal,  
26 requiring an appropriate audio-capable modular connector 700 in the reception site 30 to  
27 extract the virtual objects from the audio signal. In one embodiment, the audio signal is an  
28 analog audio signal. In another embodiment, the audio signal is a digital audio signal.

1           In yet another embodiment, the signal is a spread spectrum signal containing a digital  
2 data stream, requiring an appropriate spread spectrum receiver modular connector 700 in the  
3 reception site 30 to extract the virtual objects. In this embodiment, the spread spectrum signal  
4 is transmitted in the same bandwidth as the video or audio signal, but below the noise level.

5           Figure 28 presents embodiments associated with the delivery of virtual objects over  
6 a wired data network 3001 to a reception site 30. Virtual objects are provided to the delivery  
7 network 11 by the object delivery center 15 or directly by the operations center 10. The signal  
8 is delivered over the wired data network 3001. The signal may provide for the delivery of  
9 virtual objects, content 36 containing virtual object locations, and reception site configuration  
10 and control information. The signal may also provide for virtual object viewing data and  
11 interactive virtual object requests from the reception site 30 to the local data collection center  
12 40, to the central data collection center 50, or to the interactive object service center 60 or the  
13 signal may be a means to provide access to the Internet or other public network through which  
14 virtual objects or content 36 are delivered. The wired data network 3001 can be metallic wire  
15 or fiber, supporting any of a number of communication standards including HDSL, ADSL,  
16 DSL, ISDN, T1, T3, SONET, ATM, X.25, frame relay, Switched MultiMegabit Data Service  
17 (SMDS), or others. The signal sent over the wired data network may be generated by a data  
18 modem or transmission device, in which the appropriate modem, interface device, or Data  
19 Terminating Equipment (DTE) device is used to receive the signal and provide the embedded  
20 virtual objects to the reception site 30 modular connector 700 for processing. Embodiments  
21 of such receiving devices are shown in Figure 28 as HDSL modem 3002, ADSL modem  
22 3003, DSL modem 3003, ISDN Terminal equipment (TE) device 3005, T1 Digital service unit  
23 (DSU) 3006, T3 DSU 3007, Fiber user network interface device (UNI) 3008, ATM UNI  
24 3009, X.25 DTE 3010, Frame relay assembler/disassembler (FRAD) 3011, and SMDS  
25 subscriber network interface device (SNI) 3012. Alternatively, the reception site 30 may  
26 contain an internal modem or DTE 3013, which receives one or more signal types and provides  
27 the received signal with embedded virtual objects to the modular connector 700 in the  
28 reception site 30 for processing. Finally, the reception site 30 may be attached to a wired

1 LAN using a transceiver. In this embodiment, virtual objects may be delivered over the LAN  
2 at any time.

3 Figure 29 presents embodiments associated with the delivery of virtual objects using  
4 the public switched telephony network (PSTN) 3101 to a reception site 30. Virtual objects  
5 are provided to the delivery network 11 by the object delivery center 15 or directly by the  
6 operations center 10. The signal is delivered over the PSTN 3101. The signal may provide  
7 for the delivery of virtual objects, content 36 containing virtual object locations, and reception  
8 site configuration and control information. The signal may also provide for virtual object  
9 viewing data and interactive virtual object requests from the reception site 30 to the local data  
10 collection center 40, to the central data collection center 50, or to the interactive object service  
11 center 60 or the signal may be a means to provide access to the Internet or other public  
12 network through which virtual objects or content 36 are delivered. The signal sent over the  
13 PSTN may be generated by a data modem or transmission device, in which the appropriate  
14 modem 3102 is used to receive the signal and provide the embedded virtual objects to the  
15 modular connector 700 in the reception site 30 for processing. Alternatively, the reception site  
16 30 may contain an internal modem 3103, which receives the signal and provides the received  
17 signal with embedded virtual objects to the modular connector 700 in the reception site 30 for  
18 processing.

19 Figure 30 presents embodiments associated with the delivery of virtual objects using  
20 wireless personal communications system (PCS) 3201 to a reception site 30. Virtual objects  
21 are provided to the delivery network 11 by the object delivery center 15 or directly by the  
22 operations center 10. The signal is then delivered over the PCS network 3201. The wireless  
23 PCS system may be, for example a wireless LAN, digital cellular telephony network, analog  
24 cellular telephony network, digital cellular radio system, analog cellular radio system, digital  
25 pager network, analog pager network, or Personal Communication Network (PCN). The  
26 signal may provide for the delivery of virtual objects, content 36 containing virtual object  
27 locations, and reception site configuration and control information. The signal may also provide  
28 for virtual object viewing data and interactive virtual object requests from the reception site 30

1 to the local data collection center 40, to the central data collection center 50, or to the  
2 interactive object service center 60 or the signal may be a means to provide access to the  
3 Internet or other public network through which virtual objects or content 36 are delivered. A  
4 wireless PCS receiver 3202 is used to receive the signal and provide the embedded virtual  
5 objects to the modular connector 700 in the reception site 30 for processing. Alternatively, the  
6 reception site 258 may contain an internal wireless PCS receiver 3203, which receives the  
7 signal and provides the received signal with embedded virtual objects to the modular connector  
8 700 in the reception site 30 for processing.

9 Figure 31 depicts several embodiments associated with the delivery of virtual objects  
10 using a national or local television broadcaster's signal. Virtual objects are provided to the  
11 either the national broadcaster 1110, the broadcast affiliate 1112, or the local cable system  
12 1114 by the object delivery center 15 or directly by the operations center 10. The signal from  
13 the national broadcaster 1110 can be delivered to reception site 30', 30" or 30"" using a  
14 satellite system 1122, using a broadcast affiliate 1112 terrestrially, or using a local cable system  
15 1114. Alternatively, the local television broadcast affiliate 1112 can originate the signal which  
16 can be delivered to the reception site 30', 30" or 30"" terrestrially, or using a local cable system  
17 1114. The signal may provide for the delivery of virtual objects, content 36 containing virtual  
18 object locations, and reception site configuration and control information. The signal may also  
19 provide for virtual object viewing data and interactive virtual object requests from the reception  
20 sites 30', 30", and 30"" to the local data collection center 40, to the central data collection  
21 center 50, or to the interactive object service center 60 or the signal may be a means to provide  
22 access to the Internet or other public network through which virtual objects or content 36 are  
23 delivered. In one embodiment, the video signal is an analog video signal and the virtual objects  
24 is embedded in the video signal. In another embodiment, the video signal is a digital video  
25 signal and the virtual objects are carried as an independent data stream. In another  
26 embodiment, virtual objects may be embedded within the audio signal. In one embodiment,  
27 the audio signal is an analog audio signal. In another embodiment, the audio signal is a digital  
28 audio signal.

1           In yet another embodiment, the signal is a spread spectrum signal containing a digital  
2 data stream, requiring an appropriate spread spectrum receiver modular connector, such as the  
3 connector 700 of Figure 33, in the reception site 30', 30" or 30"" to extract the virtual objects.  
4 In this embodiment, the spread spectrum signal is transmitted in the same bandwidth as the  
5 video or audio signal, but below the noise level.

6           Alternatively, several embodiments are associated with the delivery of virtual objects  
7 using a national or local radio broadcaster's signal. The signal from the national radio  
8 broadcaster can be delivered to the reception site 30', 30" or 30"" using the satellite system  
9 1122, or using a broadcast affiliate 1122. Alternatively, the radio broadcast affiliate 1122 can  
10 originate the signal, which can be delivered to the reception site 30', 30" or 30"", terrestrially.  
11 In one embodiment, the audio signal is an analog audio signal and the virtual objects is  
12 embedded in the audio signal. In another embodiment, the audio signal is a digital audio signal  
13 and the virtual objects are carried as an independent data stream. In yet another embodiment,  
14 the virtual objects are embedded in a sub-carrier of the analog audio broadcast. In another  
15 embodiment, the signal is a spread spectrum signal containing a digital data stream, requiring  
16 an appropriate spread spectrum receiver modular connector 700 in the reception site 30', 30"  
17 or 30"" to extract the virtual objects. In this embodiment, the spread spectrum signal is  
18 transmitted in the same bandwidth as the audio signal, but below the noise level.

19           A local insertion center 20 or multiple local insertion centers may optionally be used  
20 to insert virtual objects into content 36 provided by an operations center 10 or another local  
21 insertion center 20, and any other content source. A local insertion center 20 may perform the  
22 same functions as an operations center 10. Figure 32 depicts a local insertion center 20. As  
23 shown in Figure 32, the local insertion center 20 includes a virtual object location definer 100',  
24 a virtual object selector 200', and a targeted virtual object management system 300'(TVOMS)  
25 which are identical to the virtual object location definer 100, a virtual object selector 200, and  
26 a targeted virtual object management system 300 (TVOMS) of an operations center 10. A  
27 local insertion center 20 may detect existing virtual object locations in content 36 and replace  
28 existing virtual objects with new virtual objects, delete existing virtual objects, or add new

virtual objects in existing virtual object locations and target the virtual objects to reception sites or groups of reception sites. Alternatively, a local insertion center 20 may create new virtual object locations and insert and target virtual objects within these new virtual object locations using the processes defined for the operations center 10.

Figure 33 depicts an example of a reception site 30 in more detail. The modular connector 700 may handle all interactions with a reception site 30. Programming content 36 with virtual object locations and metadata packets containing placement guidelines, mattes, and retrieval plans are received by the reception site modular connector 700 and passed to the virtual object extractor processor 780. The virtual object extractor processor 780 removes any virtual objects from the received signal and the retrieval plan information and routes the virtual objects and retrieval plan to the storage management processor 710. The storage management processor 710 uses the retrieval plan to determine which virtual objects are destined to the reception site 30 and saves the required virtual objects in virtual object storage 720. In an alternative embodiment, virtual objects may be received by the reception site 30 independent of the programming content 36.

The programming content 36 with virtual object locations is then passed to the virtual object location detector processor 750. Information received about virtual object locations is extracted from the programming content 36 and passed to the selector processor 740 which coordinates with the storage management processor 710 to determine the appropriate virtual object 38 to place into each virtual object location 37 based on placement guidelines and available virtual objects stored in the virtual object storage 720. The storage management processor 710 retrieves the appropriate virtual object 38 for one or more virtual object location 37 contained in the content 36 from the virtual object storage 720. Virtual objects are passed from the storage management processor 710 to the virtual object insertion processor 760.

Programming content 36 with virtual object locations is passed from the virtual object location detector processor 750 to the content buffer 790 where the programming content 36 is stored for a fixed period of time and then played out of the content buffer 790 to the virtual

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1 object insertion processor 760. If a virtual object 38 is available for placement in a virtual  
2 object location 37, the virtual object 38 is inserted into the appropriate virtual object location  
3 37 by the virtual object insertion processor 760.

4 In one embodiment, the virtual object location 37 may require that an embedded  
5 virtual object 38 be placed within the content 36. The virtual object insertion processor 760  
6 may use techniques for the insertion of embedded virtual objects which are described in detail  
7 in U.S. Patents 5,953,076, to Astle, Brian; and Das, Subhodev; titled System and Method of  
8 Real Time Insertions into Video Using Adaptive Occlusion with a Synthetic Reference Image;  
9 5,892,554, to DiCicco, Darrell; and Fant, Karl; entitled System and Method for Inserting  
10 Static and Dynamic Images into a Live Video Broadcast; 5,515,485, to Luquet, Andre; and  
11 Rebuffet, Michel; entitled Method and Device for Modifying a Zone in Successive Images;  
12 5,903,317, to Sharir, Avi; and Tamir, Michael; entitled Apparatus and Method for Detecting,  
13 Identifying and Incorporation Advertisements in a Video; and the MPEG4 standard, the  
14 disclosure of which are hereby incorporated by reference.

15 In another embodiment, when the virtual object location 37 may require that an  
16 overlaid virtual object 38 be placed within the content 36. The virtual object insertion  
17 processor 760 may use techniques for the overlaying of virtual objects which are described in  
18 detail in U.S. Patents 4,319,266 to Bannister, Richard S.; entitled Chroma Keying System;  
19 4,999,709 to Yamazaki, Hiroshi; and Okazaki, Sakae; entitled Apparatus for Inserting Title  
20 Pictures; 5,249,039, to Chaplin, Daniel J.; entitled Chroma Key Method and Apparatus; and  
21 5,233,423 to Jernigan, Forest E.; and Bingham, Joseph; entitled Embedded Commercials  
22 within a Television Receiver using an Integrated Electronic Billboard, the disclosure of which  
23 are hereby incorporated by reference. Programming content 36 with embedded and overlaid  
24 virtual objects is passed to an optional interactive object processor 770.

25 If an external trigger is received indicating the subscriber has selected an interactive  
26 virtual object 38, the interactive object processor 770 processes the request and passes the  
27 subscriber request to the modular connector 700. The modular connector 700, in turn, passes  
28 the request to the interactive object servicing center 60. The interactive object servicing center

1       60 will process the request and may respond back to the reception site 30 with an interactive  
2       response. Preferably, when a virtual object 38 is placed into a virtual object location 37, the  
3       selector processor records the event in the placement log 730. The placement log 730  
4       provides viewing data to the local data collection center 40 or the central data collection center  
5       50, where the information can be used for future virtual object targeting or billing of virtual  
6       object providers, for example, advertisers. The selector processor 740 can be provided  
7       targeting algorithm updates from external sources.

8           A local data collection center 40 is depicted in Figure 34. The local data collection  
9       center 40 collects, processes, and stores data from reception sites, from a central data  
10      collection center 50, or other sources. The data collected about reception sites may be  
11      provided to a local insertion center 20 to be used in targeting virtual objects in content 36.  
12      Alternatively, the data collected from receptions site may be provided to a central data  
13      collection center 50 to be used in targeting virtual objects in content 36 by an operations center  
14      10. As shown in Figure 34, communications to and from the local data collection center 40  
15      over a delivery network may be done using modular connector 700. An interface 41 receives  
16      information from reception sites. The interface 41 can include a workstation, such as the  
17      workstation 44, for example, from which an operator manually enters reception site  
18      information. Alternately, reception site information can be automatically entered at the interface  
19      41 by downloading from an off-site database, the Internet, a storage medium, such as a  
20      CD-ROM or a floppy disk, and by collecting the information directly from the individual  
21      reception sites using modular connector 700. A processor 42 processes the received reception  
22      site information and organizes the information for use and stores information in database 43.

23           A central data collection center 50 is depicted in Figure 35. The central data  
24       collection center 50 collects, processes, and stores data from reception sites, from local data  
25       collection centers, or other sources. The data collected about reception sites may be provided  
26       to a local insertion center 20 or local data collection center 40 to be used in targeting virtual  
27       objects in content 36. Alternatively, the data collected from reception site may be provided  
28       to an operations center 10 to be used in targeting virtual objects in content 36. As shown in

1       Figure 34, communications to and from the central data collection center 50 over a delivery  
2       network may be done using modular connector 700. An interface 51 receives information  
3       about reception sites. The interface 51 can include a workstation, such as the workstation 54,  
4       for example, from which an operator manually enters reception site information. Alternately,  
5       reception site information can be automatically entered at the interface 51 by downloading from  
6       an off-site database, the Internet, a storage medium, such as a CD-ROM or a floppy disk, and  
7       by collecting the information directly from the individual reception sites using modular connector  
8       700. A processor 52 processes the received reception site information and organizes the  
9       information for use and stores information in database 53.

10      An interactive object servicing center 60 is depicted in Figure 36. The interactive  
11     object servicing center 60 processes interactive requests and formulates responses to such  
12     requests. Figure 37 presents the process the interactive object servicing center 60 performs.  
13     The process begins with block 4500. In block 4501, the interactive object servicing center 60  
14     receives interactive requests from reception sites. In block 4502, the interactive object  
15     servicing center 60 determines the appropriate action to be performed based on the received  
16     interactive request. In block 4503, the interactive object servicing center 60 performs the  
17     appropriate action based on the received interactive request. In block 4504, the interactive  
18     object servicing center 60 replies to the requesting reception site with an interactive response.

19      As shown in Figure 36, communications to and from the interactive object servicing  
20     center 60 over a delivery network may be done using modular connector 700. An interface  
21     61 receives interactive requests from reception sites. The interface 61 can include a  
22     workstation, such as the workstation 64, for example, from which an operator manually enters  
23     interactive request behavior for the interactive object servicing center 60. A processor 62  
24     processes the received interactive request, performs the appropriate action, retrieving  
25     information from database 63 to perform the actions and storing transaction information in  
26     database 63 to record the transaction event.

27      A variety of virtual object targeting delivery systems have been described. One of  
28     ordinary skill in the art will recognize that the above description is that of preferred

1       embodiments of the invention and the various changes and modification may be made thereto  
2       without departing from the spirit and scope of the invention as defined in the following claims.

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